MODEL TG 88-I SERVICE MANUAL

Lowrey organs

MAGIC GENIE 88

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TG 88-1
TG 88H-1

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SPECIFICATIONS

Model TG88H-1 is the identical organ in a Horseshoe Cabinet.

SPECIFICATIONS

LOWREY MAGIC GENIE 88 (Models TG88-1 and TG88H-1)

A completely solid-state, large-scale integrated circuit (L.S.I.C.) and transistor, self-contained home spinet organ with two 44-note keyboards and a 13-note pedal board.

The organ includes two 25-watt amplifiers, two 12-inch bass speakers, one 8-inch main speaker and one 8-inch Leslie speaker.

UPPER KEYBOARD

CUSTOM VOICING

Flute 16	Trombone 16
Flute 8	Oboe 16
Flute 4	Cello 16

CUSTOM VOICING CONTROLS

Sustain Length Control

SUSTAIN/PERCUSSION PRESETS

Vibes	Harpsichord
Vibra Harp	Mandolin
Hawaiian Guitar	Banjo
Piano	Harmonic Flute

Percussion. . . Repeat/Solo Percuss

SLOW ATTACK PRESETS

Accordion Piccolo Violin

AUTO WOW PRESETS

Harmonica
Auto Wow

EFFECTS PRESETS

Vibrato Control

LOWER KEYBOARD

Piano Guitar Banjo
Genie Voices. . . Normal/Plus Organ

LOWER KEYBOARD CONTROLS

Lower. . . Soft/Medium
Lower. . . Full
Flute Volume Slider Control. . . Soft/Full

BASS

PEDAL BASS

Pedal. . . String Bass/Guitar Bass
Pedal Sustain

KEYBOARD BASS

String Bass Guitar Bass

BASS CONTROLS

Bass. . . Soft/Medium
Bass. . . Full

AUTOMATIC RHYTHMS

RHYTHM PATTERNS

Latin	Waltz
Rock	March
Country Western	Swing

RHYTHM CONTROLS

Rhythm Start. . . Normal/Auto
Rhythm Volume Slider Control. . . Soft/Full
Rhythm/Repeat Speed Control. . . Slow/Fast

GENIE

Magic Genie Chords
Chord Hold
Guitar Strum
Ukulele Strum
Piano Arpeggio
Harpsichord Arpeggio
Boogie Woogie Bass

MAGIC GENIE CHORDS

Key Note	Gives this Chord
A1	A Major
A#1	A #B_b Major
B1	B Major
C1	C Major
C#1	C#D_b Major
D1	D Major
D#1	D#E_b Major
E1	E Major
F1	F Major
F#1	F#G_b Major
G1	G Major
G#1	G#A_b Major

MAGIC GENIE CONTROLS

Strum/Upbeat/Downbeat
A2 Lower Keyboard Key adds 7th to Magic Chord
Minor Footswitch

GENERAL CONTROLS

Expression Pedal
Glide Footswitch on Expression Pedal
On/Off Switch with Pilot Light

GENERAL FEATURES

Leslie Speaker
Leslie/Stereo Flute Switch
Auxiliary Input Jack
Stereo-Headphone Jack

CIRCUIT DESCRIPTION

SCHEMATIC 1

VIBRATO, TONE GENERATORS & DIVIDERS

The Tone Generators consists of the Master Oscillator Q4, the Top Octave Synthesizers IC1 & IC2, the IC Dividers IC3-IC12 and Vibrato Oscillator Q2 & Q3. The Master Oscillator creates a high frequency signal which is applied to the Top Octave Synthesizers IC1 & IC2. Here the signal is divided to create thirteen specific octave frequencies which are applied to the IC Dividers where these frequencies are divided in half twice creating lower octave frequencies. These signals are then connected through diodes to Upper and Lower Keyboard Diode Keying circuits and also directly to the Pedal Diode Keying circuits.

Q1 VIBRATO DELAY SWITCHER

Turning on the Harmonica, Violin, Piccolo or Vibra Harp Tabswitches connects the collector of the Vibrato Delay Trigger Q67 to the base of the Vibrato Delay Switcher Q1 (via Point AL on the Vibrato Delay Tabswitch contacts.) Each time a key is pressed a positive pulse is developed at the collector of Q67. This pulse is applied to the base of Q1 causing Q1 to conduct which grounds the Vibrato Oscillator, momentarily turning it off. This causes a short delay time before the vibrato is heard on the above-mentioned voices.

Q2 & Q3 VIBRATO OSCILLATOR

The Vibrato Oscillator develops a continual low frequency (6.3 Hz) sine wave of sufficient amplitude to shift the frequency of the Master Oscillator high and low creating a Vibrato effect. The output from the Vibrato Oscillator is applied to the Master Oscillator and CFG Master Oscillator via the Vibrato switching contacts. It is also applied directly to the Tremolo Lamp Driver Q16 and through the Harmonica Tabswitch to LED Driver Q70. Turning on the Violin, Piccolo or Hawaiian Guitar tabswitches connects the Vibrato Oscillator to the Master Oscillators, automatically adding Vibrato on these voices. Turning on Hawaiian Guitar also removes a 2.2K resistor from ground at the output of the Vibrato Oscillator giving the Hawaiian Guitar a heavier vibrato. To obtain vibrato with the Kinura, Viola, Cello, Oboe and Trombone voices, the vibrato tabswitch must be turned on. Turning on a Rhythm in the Magic Chord mode cancels the vibrato of the Lower Keyboard. NOTE: Turning on the Vibes, Piano, Mandolin, Banjo or Harmonic Flute tabs will cancel vibrato by opening the path from the Vibrato Oscillator to the Master Oscillators through the Vibrato Switching Contacts. The vibrato of the Vibes, Vibra Harp and Harmonica will not be cancelled because the Vibrato Oscillator is connected to these circuits ahead of the vibrato switching contacts.

Q4, IC1 & IC2 MASTER OSCILLATOR & TOP OCTAVE SYNTHESIZERS

Q4 develops a continual high frequency signal which is sent to the Top Octave Synthesizers IC1 & IC2. Here the signal is divided simultaneously to produce thirteen specific audio frequency signals. These signals are connected to the Upper & Lower Keyboard Diode Keying circuits and also the IC Dividers IC3-IC12 where they are divided down to produce lower organ tones. The signal outputs are of a particular octave frequency and are shown boxed on Schematic 1. (The letter-number designation within these boxes refer to a specific octave frequency and should not be confused with a keyboard designation.)

IC3-IC12 IC DIVIDERS

Audio signal from the TOS is applied to the IC Dividers where these signals are divided in half several times to create lower organ frequencies. A chart is provided on Schematic 1 giving the specific outputs of each divider. IC11 & IC12 outputs are used for the lowest seven upper keyboard notes when the Flute 16 voice is on, and for the lowest three lower keyboard notes when the Magic Genie Chord tab is off. Part of IC11 is also used for the Pedal Divider.

SCHEMATIC 2

UPPER KEYBOARD DIODE KEYING GROUPS, FLUTE SWITCHING, COLLECTOR AMPS & LESLIE PREAMPS

Audio signal from the Tone Generators (via the Upper Keyboard Diode Keying circuitry - see Schematic 6) is divided into groups of six to seven notes each called Diode Keying groups. These groups are filtered individually by the upper keyboard Flute filters for each organ footage: 4, 8 and 16. After filtering, the signal from the Diode Keying groups is collected and amplified before being sent to voicing circuits where the various organ voices are created. All Flute signal is applied to the Leslie Preamps where it is amplified before being routed to the Leslie amplifier.

CIRCUIT DESCRIPTION

Q7 & Q8, Q11 & Q12, Q22 & Q23 - 4,8 & 16-FOOT FLUTE COLLECTOR AMPS & SWITCHERS

Audio signal from 4, 8 and 16-foot Flute Collector lines is applied to its associated Flute Collector Amp where the signal is amplified. The output of each Flute Collector Amp is then connected to its associated Flute Switcher. The Flute Switchers are N Channel FET transistors and are gated off by a negative voltage at their gate. Turning on a Flute tabswitch removes this negative voltage causing the switcher to conduct, allowing the Flute signal to pass to the Leslie Preamps.

Q6 VIOLIN COLLECTOR AMP

Audio signal from the 4-foot Diode Keying groups is applied to the Violin Collector Amp Q6 via the Violin Collector line. Here the signal is amplified then routed through a Violin 4 tabswitch contact to an R/C voicing circuit where the proper Violin tonality is created. After the signal is voiced, it is then applied to the input of the Percussion and Slow Attack Modulator IC14.

Q9 & Q10 4-FOOT PERCUSSION COLLECTOR AMPS

Turning on either the Harmonic 4, Vibes or Piccolo 4 tabswitch allows audio signal from the 4-foot percussion collector line to pass to the 4-foot Percussion Collector Amps. Here the signal is amplified and then voiced before being applied to the input of the Percussion and Slow Attack Modulator IC14.

Q13, 14 & 15 — 16-FOOT MAIN FLUTE, VIBRA HARP & VIBES COLLECTOR AMPS & PREAMP

Audio signal from the 16-foot Main Flute, Vibra Harp & Vibes Collector Line is applied to Q13 & 14 where it is amplified. Turning on the Flute 16, Vibra Harp or Vibes tabswitch allows this signal to pass through Tremolo Photocell P1 to Q15. Here the signal is amplified and voiced before being applied to the Main Preamp Q37.

Q16 & Q17 TREMOLO LAMP DRIVERS

Sine wave input is applied to the Tremolo Lamp Drivers from the Vibrato Oscillator and is transformed to a series of high current positive output pulses at the Emitter of Q17. Turning on the Vibra Harp or Vibes tab connects these pulses to the bulb in Photocell P1 causing the bulb to pulsate on and off. As the bulb pulsates, the resistance of the Photocell in P1 varies which allows signal from Q13 & Q14 to be pulsated through P1 creating the tremolo effect for these voices. (Turning on the Flute 16 tab with either of these voices will reduce the intensity of their tremolo). Turning on the Flute 16 tab applies a positive DC voltage to the bulb in Photocell P1 allowing signal from Q13 & Q14 to pass through P1 without a tremolo effect. Turning on the Leslie switch with Flute 16 lowers the DC voltage on the bulb and also connects the pulsating output of Q17 to the bulb. This combination of DC and pulsating voltage causes the signal passing through P1 to have only a slight tremolo effect.
NOTE: The Flute 16 voice is the only Flute voice that plays in both the Main & Leslie Channels. This is done to reinforce the Leslie at lower Flute 16 frequencies. Turning on the Leslie tremolo switch pulsates the Main Flute 16 signal through Photocell P1 giving it a tremolo effect.

Q20 & Q21 LESLIE PREAMPS

All upper and lower keyboard Flute signal is applied to the Leslie preamps where the signal is amplified before being routed via P5 to the Leslie Amplifier.

SCHEMATIC 3

UPPER KEYBOARD COLLECTOR AMPS, TABSWITCHING PREAMPS & MODULATOR

Audio signal from Reed/String Collector lines is routed via tabswitches to voicing circuits and preamps to create the various organ voices. Some signal is applied to the Percussion and Slow Attack Modulator for use on voices with a Percussive or Slow Attack character. The output of all these circuits is applied to the Main Preamp before being routed to the reverb circuits and the Main Amplifier.

Q28 & Q29 16-FOOT R/S COLLECTOR AMP & EMITTER FOLLOWER

Turning on the Cello, Oboe, Trombone, Hawaiian Guitar, Piano, Harpsichord, Banjo, Mandolin, Accordion, Harmonica or Auto Wow tabs removes the ground from the input of the 16-foot R/S Collector Amp Q28. This allows signal from the 16-foot R/S Collector line to pass to Q28 & Q29 where the signal is amplified and transformed to a low impedance signal. This signal is then routed via tabswitches to the Horn, Harpsichord, Banjo and Main Preamps. Turning on the Accordion, Banjo or Mandolin tabs also ungrounds the 16-foot Percussion Grounding Line opening the signal path from Q29 to the Percussion and Slow Attack Modulator. Signal is also routed to the Auto Wow and Harmonica Preamp Q71.

CIRCUIT DESCRIPTION

IC14 & Q27 PERCUSSION & SLOW ATTACK MODULATOR & EMITTER FOLLOWER

The Vibes, Mandolin, Banjo, Harmonic Flute, Accordion, Piccolo and Violin voices are the Percussion and Slow Attack voices of the organ. Turning on any of these voices performs two functions relating to Modulator IC14. The first function of these tabs is to allow signal to reach the input of the Modulator (Pin 3) from (depending on voice being played) the 16-foot R/S Collectors, Violin Collector Amp or 4-foot Percussion Collector Amp. The second function is to connect keying pulses from (depending on voice being played) the Percussion Modulator Driver, the Repeat Modulator Driver or the Slow Attack Modulator Driver to Pin 5 of Modulator IC14. These keying pulses connected to Pin 5 allow the signal to pass through IC14 and give it the Percussion or Slow Attack effect. The signal is then applied to the base of Q27 where it is transformed to a low impedance output signal before being routed, via the above-mentioned tabs, to various voicing circuits and then to the Main Preamp Q37.

Q30 HARPSICHORD PREAMP

Turning on the Harpsichord tabswitch allows audio signal from the 16-foot R/S Collectors to pass to the Harpsichord Preamp Q30. Here the signal is amplified and then routed to the Main Preamps. Audio signal from the Harpsichord arpeggio tab is also applied to Q30.

Q33 & Q34 BANJO PREAMPS

Audio signal from the Upper Keyboard Banjo, Oboe and Hawaiian Guitar and Lower Keyboard Guitar Bass, Banjo & Ukulele Strum tabswitches is amplified by the Banjo Preamps. The signal is then voiced at the output of Q34 before being applied to the Main Preamps.

Q35 & Q36 HORN PREAMPS

Audio signal from the Upper Keyboard Trombone, Hawaiian Guitar, Upper and Lower Keyboard Piano and Pedal Bass Guitar and Piano Arpeggio is amplified by the Horn Preamps. The signal is then voiced at the output of Q36 before being applied to the Main Preamps.

Q37 & Q38 MAIN PREAMPS

All Upper Keyboard R/S, Special Effect and 16-foot Main Flute signal, Lower Keyboard R/S signal and Pedal Guitar Bass signal is applied to the Main Preamps where the signal is amplified. This signal is then routed via P5 to the Main Amplifier.

SCHEMATIC 4

LOWER KEYBOARD DIODE KEYING FILTERING & TABSWITCHING AND AUTO RHYTHM START

There are 44 Lower Keyboard accompaniment keyswitches. Pressing an accompaniment key applies positive voltage (through L8) to the anode of a diode D18, allowing audio signal from the tone generators to pass to the Accompaniment Modulator IC16 and Flute Collector Amp Q40. Turning on the Magic Genie Chord tabswitch disables the first twelve accompaniment keys (A1-G#1). The outputs from the Magic Chord R/S Preamp Q79 and Magic Chord Flute Emitter Follower Q80 (see Drawing 7) are then routed respectively to the Accompaniment Modulator IC16 and Lower Flute Volume Control VR6. With the Magic Chord tab on, the A2 accompaniment keyswitch becomes the 7th switch. Pressing the A2 keyswitch applies a positive voltage to the 7th Enable IC18D (see Drawing 7) which adds the 7th note to the Magic Genie Chord being played.

IC16, Q42 ACCOMPANIMENT MODULATOR & EMITTER FOLLOWER

Audio signal from the Lower Keyboard R/S Collector Line or Magic Chord R/S Preamp Q79 is applied to the input of Modulator IC16. Here the signal is amplified before being applied to the Accompaniment Emitter Follower Q42. Signal can only pass through the Modulator when a positive voltage is applied to Pin 5 from the Accompaniment Modulator Driver Q87. With no rhythm on, a steady positive voltage is applied to Pin 5 holding the Modulator on, allowing signal to pass through unmodulated. With a Rhythm Tabswitch on, positive voltage pulses are applied to Pin 5 from the Accompaniment Modulator Driver Q87, gating the signal through the Modulator at the speed (tempo) of the rhythm. Placing the Genie Voices tab in the + Organ position applies a steady positive voltage to Modulator IC16 allowing the accompaniment to play unmodulated when using a rhythm. The signal is then applied to the Accompaniment Emitter Follower Q42 where it is transformed to a low impedance output signal before being applied to various voicing circuits and the Main Preamp Q37 via the Accompaniment Tabswitches.

CIRCUIT DESCRIPTION

Q40 LOWER KEYBOARD FLUTE COLLECTOR AMP

Audio signal from the Flute Collector Line is filtered by the Lower Keyboard Flute filters (3L-5H). The signal is then collected together at the output of the filters and applied to the base of Q40. Here the signal is amplified before being sent via the Lower Keyboard Flute Volume Control VR6 to the Leslie Preamps. Audio signal from the Magic Chord Flute Emitter Follower Q80 is also applied through VR6 to the Leslie Preamps.

AUTOMATIC RHYTHM START

The function of the Automatic Rhythm start circuitry is to: 1) Start the Rhythm when an Accompaniment Keyswitch is pressed, and 2) Hold the Rhythm on for a short period of time and then stop it after releasing an Accompaniment Keyswitch.

With the Rhythm Start Tabswitch in the Normal position, the Function Generator Enable Q45 is off and the rhythm starts normally by placing a Rhythm Tabswitch on. Placing the Rhythm Start Tabswitch in the Automatic position removes a resistor to ground from the base of the Keydown Detector Q43 and if no Accompaniment Keyswitch is held, it causes a voltage rise that will turn off the normally on Q43. When Q43 turns off, it removes positive voltage from the base of Function Generator Enable Driver Q44, causing it to turn off, applying a positive voltage to the base of the Function Generator Enable Q45 turning it on. When Q45 turns on, it grounds Pin 5 of the Rhythm Function Generator IC23, disabling the output on Pins 9-15. When an Accompaniment Keyswitch is pressed, it loads the base of Q43, lowering the voltage and causing it to conduct. When Q43 conducts, it charges the capacitor through Diode D19 while applying a positive voltage to the base of Q44. The positive voltage on the base of Q44 causes it to conduct, lowering the voltage on the base of Q45, causing it to turn off which applies positive voltage to Pin 5 of IC23. This enables the outputs on Pins 9-15 enabling the rhythm to play. Upon releasing the accompaniment keys, the capacitor which was charged through Diode D19, discharges and holds Q44 on for the duration of its discharge time. This allows the rhythm to play for a short time after releasing the Accompaniment keys.

SCHEMATIC 5

BASS PEDALS

Pressing a bass pedal causes the following:

1) A pulse is developed across the .22 capacitor (connected to the C1 Pedal Switch) causing the Pedal Cancel Trigger to operate.
2) A generator output Diode D22 is biased on, allowing tone generator signal to pass through Diode D23 to the base of the Pedal Collector Amp Q50.
3) A 5.6 mfd capacitor is charged, which holds Diode D22 on after the pedal has been released.
4) The Pedal Keyer conducts applying a positive voltage to its Emitter Follower causing the Emitter Follower to conduct which allows signal from the Pedal Divider to pass to the Pedal Amp. The Pedal Keyer also delivers a positive pulse to the Horn Preamp if the pedal tabswitch is in the Guitar Bass position.

Q47 & Q48 PEDAL CANCEL TRIGGER

Pressing a pedal develops a pulse across the .22 capacitor connected to the C1 Pedal Switch. This momentarily lowers the voltage on the base of Q47 turning it off. When Q47 turns off, it applies a positive voltage pulse to the base of Q48; this causes Q48 to turn on, momentarily grounding the Pedal Keying Line which discharges any previously charged 5.6 uf pedal sustain capacitor. This turns off the signal path of the previously played pedal making sure that only the signal from the pedal being played enters the Pedal Divider. (If more than one signal at a time enters the Pedal Divider, rumble will occur.)

Q50 PEDAL COLLECTOR AMP

Audio signal from the Tone Generators is applied through a Diode D22 and D23 to the base of the Pedal Collector Amp each time a pedal is played. This signal is amplified to an amplitude sufficient for driving the Pedal Divider IC11.

IC11 PEDAL DIVIDER

Part of IC11 is used as the Pedal Divider. Audio signal is applied to the divider where it is divided in half. The output signal from the Pedal Divider passes to the Pedal Amp when Pedal Keyer Emitter Follower Q51 conducts and turns on Diode D27.

Q49 PEDAL KEYER

Playing a bass pedal applies a positive voltage through a Diode D24 simultaneously to the Emitter and Bass of the Pedal Keyer Q49. This causes Q49 to conduct applying a positive voltage to the base of Pedal Keyer Emitter Follower Q51. This voltage is also applied as a pulse to the anode of D29 allowing a short burst of signal to pass through D29 &

CIRCUIT DESCRIPTION

D30 to the Horn preamp when the pedal tab is in the Guitar bass position. This short burst of signal creates the Guitar bass Harmonic.

Q51 PEDAL KEYER EMITTER FOLLOWER

Positive voltage from the Pedal Keyer is applied to the base of the Pedal Keyer Emitter Follower Q51. This causes Q51 to conduct applying a positive voltage to the anode of D27, allowing signal from the pedal divider to pass to the Pedal Amp, Q53. When Q51 conducts a positive voltage is also applied to the base of the Genie Bass Killer Q58. The positive voltage applied to the base of Q51 also charges the .22 capacitor there and with either the pedal sustain or the Pedal Guitar Bass/String Bass tab in the on position this capacitor discharges onto the base of Q51 holding it on momentarily. This allows signal from the pedal divider to pass to the Pedal Amp after the pedal has been released and gives the pedal sustain effect.

Q52 PEDAL AMP

Audio signal from the Pedal Divider is applied to the base of the Pedal Amp where it is amplified. The output signal is then routed, via the bass volume tabs, to String Bass Preamp Q59.

Q58 LOWER KEYBOARD BASS KILLER

Q58 receives a positive voltage on its base from the Pedal Keyer Emitter Follower Q51 each time a pedal is played. This voltage causes Q58 to turn on which grounds the output of the Auto Bass Emitter Follower Q90 cancelling the Lower Keyboard Genie Bass until the pedal is released. This makes it possible to play the bass pedals at various intervals while the Genie Bass is being used.

Q59 & Q60 STRING BASS PREAMPS

Audio signal from the Pedal Amp and the Auto Bass Emitter Follower is applied to Preamp Q59 where it is amplified and voiced for proper tonality. The signal is then routed to the Leslie Preamps and Preamp Q60. Q60 amplifies the signal once more before being routed to the Main Preamps. Preamp Q60 is also used to amplify signal from the Rhythm Preamp Q86.

SCHEMATIC 6

UPPER KEYBOARD KEYING, AUTO WOW, HARMONICA, SLOW ATTACK & PERCUSSION KEYING

UPPER KEYBOARD KEYING

Pressing an Upper Keyboard Keyswitch F1-C4, applies a positive voltage (through a 10K and 33 ohm Resistor off the base of Q62) through Diodes D35, 36, 37 & D4 (see Drawing 1), while charging a 30 uf capacitor. The voltage applied through these Diodes allows signal from the Tone Generators to pass through to the 4, 8 and 16-foot Diode Keying Groups. The signal is then filtered and amplified before being applied to Upper Keyboard tabswitches where it is routed to various voicing circuits, preamps and then to the Main and Leslie Amps. Upon releasing a key, the 30 uf capacitor discharges, holding Diodes D35, 36, 37 & D4 on momentarily - creating a sustain effect. The rate at which the 30 uf capacitor discharges or the length of sustain, is controlled by altering the voltage on the base of the Sustain Length Regulator Q65.

NOTE: Schematic 6 shows a one-note example of Upper Keyboard diode keying. Each footage output shown has 44 identical circuits. Taking the 4-foot output as an example, there are (44) 47K, 68K and 6.8K resistors and Diodes D35. Six to seven-note Diode Keying Groups are then formed for filtering at the junction of each 68K and 6.8K resistor.

Q65 SUSTAIN LENGTH REGULATOR

The discharge rate of the 30 uf capacitor is controlled by the voltage applied to the base of Q65. As the voltage on the base varies, the length of sustain or discharge rate of the 30 uf capacitor varies. Only the sustain length contacts override the Custom Sustain Control VR3. The sustain length of all other Upper Keyboard voices is controlled by VR3.

NOTE: Mandolin and Banjos sustain length is controlled by VR3 when the Percussion tab is in the solo position.

Turning the Mandolin tab on, leaves the base of Q65 open, removing it from the circuit and giving the longest sustain. Turning the Banjo, Accordion, Piccolo or Violin tab on, applies ground to the base of Q65, causing it to conduct hardest, giving no sustain. Turning the Harpsichord tab on, applies positive voltage to the base of Q65 causing it to con-

duct, slightly giving a medium sustain effect. With the Piano tab on, the length of sustain is slightly longer because more positive voltage is applied to the base of Q65, by removing the 1.5K ohm resistor from the circuit. Turning on the Hawaiian Guitar, Vibra Harp and Vibes tabswitches, removes the 10K resistor from the circuit applying more positive voltage to the base of Q65, creating a longer sustain. When more than one of the Upper Keyboard preset sustain tabs are on, the sustain length of the voice located farthest to the left will dominate because of the series opening configuration of the sustain length contacts.
NOTE: A PNP transistor conducts when the base voltage is .6V lower than the emitter voltage. The more positive the emitter is, in relation to the base, the harder the transistor will turn on.

Q64 SUSTAIN CANCELLER

Pressing an Upper Keyboard keyswitch causes Q62, the Auto Wow and Slow Attack Keydown Detector, to conduct. This applies a positive voltage through Diode D32 to the sustain cancel tabswitch contacts (see Drawing 3). Turning on an Upper Keyboard voice containing one of these tabswitch contacts, connects the positive voltage from Q62 to the base of Sustain Canceller Q64. This voltage develops a positive pulse across the 10 uf capacitor and momentarily turns on Q64 each time a key is pressed. This momentarily grounds the sustain line which cancels the sustain of any previously played note, creating a monophonic or one-note sustain effect.

SLOW ATTACK

Placing the Harmonic Flute, Banjo, Mandolin and Vibes tabswitches in the off position, and either the Accordion, Piccolo or Violin in the on position, connects voltage output from the Slow Attack Modulator Driver Q63 to Pin 5 of the Percussion and Slow Attack Modulator IC14.

Q62 AUTO WOW & SLOW ATTACK KEYDOWN DETECTOR

Pressing an Upper Keyboard keyswitch lowers the voltage on the base of Q62, causing it to conduct. This applies a positive voltage through a 2.2M resistor and charges a .047 capacitor. The RC time constant of this capacitor and resistor cause a slowly rising voltage to appear on the base of the Slow Attack Modulator Driver Q63. Upon releasing a key, any remaining voltage in the .047 capacitor will discharge through Diode D33. Q62 also applies a positive voltage to the sustain cancel tabswitch contacts (see Circuit Description Q64 & Drawing 3), and the Auto Wow Keyer (see Q66).

Q63 SLOW ATTACK MODULATOR DRIVER

A slowly rising voltage is applied to the base of the Slow Attack Modulator Driver Q63, causing it to turn on slowly. This applies a steadily increasing voltage to the Percussion and Slow Attack Modulator IC14, gating the signal through it and creating the slow attack effect used for the Accordion, Piccolo and Violin voices.
NOTE: The slow attack effect is only present when the Banjo, Mandolin, Harmonic Flute and Vibes tabswitches are off. Turning on one of these voices overrides the slow attack effect and only the percussion effect is heard.

AUTO WOW

Pressing an Upper Keyboard keyswitch activates the Auto Wow keying circuitry. The purpose of the Keyer, Vibrato Delay Trigger, Shaper and Reset is to vary the voltage on the LED Driver by varying the discharge rate of the 1 uf capacitor at the collector of the Auto Wow Reset; thus giving the proper Auto Wow wave form.

Q66 AUTO WOW KEYER

Positive voltage from the collector of Q62 is applied to the base of the Auto Wow Keyer Q66 each time a key is pressed. This develops a positive pulse across the .1 capacitor, causing Q66 to conduct, which momentarily lowers the voltage on the bases of the Vibrato Delay Trigger Q67 and the Auto Wow Reset Q69.

Q67 VIBRATO DELAY TRIGGER

The voltage on the base of Q67 is momentarily lowered, causing it to turn off. This applies a positive voltage pulse to the base of Auto Wow Shaper Q68. A positive voltage pulse is also applied to the Vibrato Delay Switcher Q1 (see A1) via the vibrato delay tabswitch contacts (see Drawing 3).

Q69 AUTO WOW RESET

A positive voltage applied to the base of the Auto Wow Keyer Q66 from the Auto Wow and Slow Attack Keydown Detector Q62, causes Q66 to conduct. This develops a pulse across the .05 capacitor at the base of Auto Wow Reset Q69, causing it to conduct, charging the 1 uf capacitor at its collector. This is done to insure the 1 uf capacitor is fully charged each time a key is pressed.

CIRCUIT DESCRIPTION

Q68 AUTO WOW SHAPER

Positive voltage pulses are applied to the base of Q68 from the Vibrato Delay Trigger Q67, each time an Upper Keyboard key is pressed. This causes Auto Wow Shaper Q68 to conduct, discharging the 1 uf capacitor at its collector. This applies a voltage of varying amplitude to the base of the LED Driver Q70 when the Harmonica tab is in the off position.

Q70 LED DRIVER

The LED Driver Q70 has voltage applied to its base from the Auto Wow keying circuitry or the Vibrato Oscillator, depending on the position of the Harmonica tabswitch. (If Auto Wow and Harmonica are both on, Harmonica will override Auto Wow.) The voltages applied to the LED Driver causes it to conduct, applying a varying voltage to the light-emitting diode in Photocell P2. This causes the photocell's resistance to fluctuate, thereby varying the circuit output and giving the Harmonica or Auto Wow effect.

Q71 AUTO WOW & HARMONICA PREAMP

Audio signal from the 16-foot R/S Emitter Follower Q29 is applied to the base of this preamp. The Harmonica and Auto Wow preamp is a variable tuned circuit that amplifies only audio signals at the frequency which it is tuned. The frequency range of Q71 is adjusted by Photocell P3. The output of the Auto Wow and Harmonica preamp is then connected to the Main Preamp Q37.

Q72 EMITTER FOLLOWER

This circuit determines the frequency that the Auto Wow and Harmonica preamp is tuned by electrically changing the effective value of the .01 uf capacitor attached to its emitter.

PERCUSSION

Turning on the Vibes tab or the Mandolin, Banjo or Harmonic Flute tabs with the Percuss tab in the solo position, connects a positive voltage pulse from the Percussion Modulator Driver Q74, to Pin 5 of the Percussion and Slow Attack Modulator IC14, each time an Upper Keyboard key is pressed.

Q73 & Q74 PERCUSSION KEYDOWN DETECTOR & MODULATOR DRIVER

Pressing an Upper Keyboard key develops a pulse across the 1 uf capacitor at the base of Q73. This momentarily lowers the voltage on the base of Q73, causing it to turn off. When Q73 turns off, it applies a positive voltage from its collector to the base of the Percussion Modulator Driver Q74, causing it to turn on applying a positive voltage pulse via the Percussion and Slow Attack contacts (see Drawing 3), to the Percussion and Slow Attack Modulator IC14. This causes audio signal to be gated through IC14 for the length of the pulse, giving the percussion effect to these Upper Keyboard voices.

SCHEMATIC 7

CHORD FUNCTION GENERATOR (CFG)

CHORD FUNCTION GENERATOR IC20

The Chord Function Generator IC20 contains a keyboard scanning system, five programmable frequency generators and the required logic to provide four output features which are bass, chord, strum and arpeggio. The keyboard scanning system is capable of scanning 72 time points on a sequential basis. The scan matrix is partitioned in a 12 (X scan) by 6 (Y scan) array. Sequential pulses are outputted on the 12 "X" lines and a particular time point is active when one of the "X" lines is connected to one of the "Y" lines. In the non-chord mode (Magic Genie Chord tab off) the bass feature is the only function that is enabled. In this mode of operation bass signal is outputted from Pins 6 & 7 of the CFG. In the chord mode (Magic Genie Chord tab on) circuitry is enabled to add data bits. These bits correspond to the notes in the chord being played. For example, if a chord is being played there will be data bits at 3 of the 72 time points. If the A2 Key (which is the 7th switch) is pressed, a fourth data bit is added to the chord; pressing the minor footswitch shifts the data at one of the time points creating the minor of the chord being played. The minor and 7th of the chord reset with each new keydown. The other features of the chip, strum and arpeggio, can also be enabled when the chip is in the chord mode. All the features are outputted when a key is pressed. If the chord hold tab is turned on, the features latch and will continue to play after the key is released. Turning on a rhythm disconnects Pin 21 of the CFG from Pin 31 of the CFG. This sets up the CFG to accept rhythm pulses for triggering the Boogie Woogie Bass sequence.

Q76 CHORD FUNCTION MASTER OSCILLATOR

Q76 develops a continual high frequency signal that is applied to five programmable frequency genera-

tors via Pin 24 of the CFG IC20. The programmable generators are each capable of generating one of 12 frequencies, dependent on the address code provided them. These generators supply the audio signal for the bass in both the chord and non-chord mode of the CFG. The generators also supply the audio signal for the Magic Chords, strum and arpeggio features in the chord mode of the CFG. If a vibrato preset is on, the features that are outputted will have a vibrato effect, unless a rhythm tab is on. In this case, the output from the vibrato oscillator is grounded cancelling vibrato of the Lower Keyboard features.

MAGIC GENIE CHORDS

There are 28 Lower Keyboard bass keyswitches. The first 12 of these are also Magic Chord Keyswitches. Turning on the Magic Chord tabswitch disconnects Pin 21 from Pin 29 of the CFG IC20. This puts the CFG in the chord mode of operation. Pressing a Magic Chord keyswitch (A1-G#1) connects a Y scan line to an X scan line, causing data bits to appear at three CFG time points. These data bits provide the address code for the programmable frequency generators, causing three audio frequencies that form a specific chord to be outputted at Pin 5 of the CFG. These audio signals are then applied to the Magic Chord R/S Preamp Q79 and the Magic Chord Flute Filter IC21A&B. Q79 amplifies the audio signal before being routed to the Accompaniment Modulator IC16. The signal applied to IC21-A&B is voiced for proper Flute tonality and routed through Q80 to the Lower Flute Volume Control. Turning on the Magic Chord tab also disables the A2 Accompaniment keyswitch, shown on Drawing 4, which now becomes the 7th switch. Pressing this key adds the 7th component to the chord being played.

NOTE: In the Magic Chord mode of operation, only the highest chord being played will sound.

7TH & MINOR ENABLE

With Pin 12 of IC18D held low, IC18D appears as an inverter and its output at Pin 13 is the inverted input of the X Scan Line from Pin 26 of IC20. Due to the nature of the X Scan Lines, the inputs on Pins 2 & 3 of IC18A can either be opposite or both low. When Pin 26 of IC20 goes low, Pin 13 of IC18D goes high and, since Pins 2 & 3 must be opposite, Pin 1 of IC18A goes low. In effect, the X Scan output from Pin 26 has been connected through IC18D & A to the Y Scan Line from Pin 21, and when Pin 26 goes low it activates the 7th time point of the CFG chip. This is the condition of the CFG chip when the 7th component of the chord is not being played. To enable the 7th component to play the X & Y Scan Lines must be momentarily disconnected. This is accomplished by the following: Turning on the Magic Chord tabswitch connects the A2 accompaniment keyswitch (shown on Drawing 4) to Pin 12 of IC18D. Pressing the A2 keyswitch at this time causes Pin 12 of IC18D to go high which in turn causes a low on Pin 13 and a high on Pin 1. With Pin 1 held high, the Y Scan Line from Pin 21 does not feel the negative transistion of the X Scan Line from Pin 26. This deactivates the 7th time point and adds the 7th component to the chord being played.

The Minor Enable operates in the same manner, using the X Scan output from Pin 27 of the CFG and Minor Enable IC18B. The minor is enabled by pressing the minor footswitch which is located to the right on the expression pedal.

STRUM KEYING

Holding a chord keyswitch with the Magic Chord tabswitch on outputs the frequencies of the chord being played on the four strum output frequency lines, Pins 1, 2, 3 & 40. If the Ukulele tab is on, Pin 32 of the CFG is disconnected from Pin 21 of the CFG and the frequencies outputted on Pins 1, 2, 3 & 40 will be of a higher octave. Pulses from either Pin 9, 10, 14 or 15 of the RFG IC23 (depending on the position of the Strum/Upbeat/Downbeat and Boogie Woogie bass tabs) are applied through IC18C & IC19B to Pin 15 of the CFG IC20. Each time a pulse occurs at Pin 15, the CFG generates a sequence of keyer pulses which are outputted on the four Strum Keying Lines, Pins 8, 9, 10 & 11. The frequency of this sequence of keyer pulses is determined by the RC network on Pin 14 of the CFG. The first keyer pulse appears on the root keying line then the 3rd, 5th & 7th. If the 7th of the chord is not enabled (see 7th Enable), the sequence will not include a pulse on Pin 8 for the Strum 7th signal. The pulses on the four keying lines are applied to the anodes of Diodes D84, 87, 90 and 93, turning them on, allowing audio signal on the four strum signal lines to pass to the Strum Preamp Q77. Here the signal is amplified and routed via either the Guitar or Ukulele strum tabs to various voicing circuits and the Main Preamp Q37.

CIRCUIT DESCRIPTION

ARPEGGIO KEYING

Turning on the Piano or Harpsichord Arpeggio tab disconnects Pin 21 of the CFG from the Pin 25 of the CFG and with the Magic Chord tab on. This enables the internal arpeggio shift register. Pulses are applied to the shift register from one side of the internal arpeggio clock oscillator. The shift register advances with every other transition of the clock and generates a keying pulse which appears on Pin 13 of the CFG. The speed of the clock is synchronized to the rhythm through the Arpeggio Pulse Shaper IC19C. The shift register also addresses a multiplexer which has as its input 3 octaves of root, 3rd and 5th frequencies of the Magic Chord being played. The output of the Multiplexer passes through some gating and appears on the arpeggio signal line, Pin 39 of the CFG. A different frequency is outputted on Pin 39 each time the shift register advances. When a keyer pulse is present on Pin 13, D96 is turned on allowing the audio signal on Pin 39 to pass to the arpeggio Preamp Q78. Here the signal is amplified and routed through the Piano or Harpsichord tabs to various voicing circuits and the Main Preamp Q37.

HIGH/LOW BASS

With the Magic Genie Chord tabswitch off, the only feature of the CFG chip that is outputted is the High/Low Bass. In this mode of operation, holding down two or more lower keyboard keyswitches (A1-C3) causes the following: audio signal corresponding to the highest note being played is outputted from Pin 6 of the CFG and audio signal corresponding to the lowest note being played is outputted from Pin 7 of the CFG. The high bass signal is routed to Pin 2 of the RFG IC23 and the Low bass signal is routed to Pin 3 of IC23. (See Bass Keying.)

ROOT/FIFTH BASS

With the Magic Genie Chord tabswitch on, the bass feature of the chip is in the Root/Fifth mode of operation. If a Magic Genie Chord (one-note chord) is held at this time, the audio signals at the bass root output (Pin 7) and bass 5th output (Pin 6) are the root and 5th components of the chord being played. The 5th bass signal is routed to Pin 2 of the RFG IC23 and the Root Bass signal is routed to Pin 3 of IC23. (See Bass Keying.)

BOOGIE WOOGIE BASS

Turning on the Boogie Woogie Bass tab with the Magic Chord tab on causes the following conditions:

1. The X Scan Line from Pin 30 of the CFG IC20 is connected to the Y Scan Line at Pin 21 of the CFG. This activates the CFG time point for the Boogie Woogie bass pattern.
2. Turning a rhythm on at this time disconnects Pin 31 of the CFG from Pin 21 of the CFG. This allows the CFG to accept rhythm pulses at the Boogie Woogie advance input, Pin 37.
3. The Hi/Fifth output Pin 6 of the CFG becomes an input and is connected through a Magic Chord contact (see Drawing 8) to Pin 12 of IC19F. At organ power on the output of IC19F is held high blocking Boogie Woogie advance pulses from entering Pin 37 of the CFG. When a negative pulse from Pin 15 of the RFG IC23 occurs, Pin 12 of IC19F makes a negative transition which resets the Shift Register through Pin 6 of the CFG and also allows bass advance pulses to pass to Pin 37 of the CFG. The above assumes that the organ was turned on with the Magic Chord, Boogie Woogie Bass and a rhythm tab on. This circuit ensures that the Boogie Woogie bass shift register is in the correct state before advance pulses can be applied to Pin 37.
4. Pins 2 & 3 of the RFG IC23 are tied together through the rhythm tabswitches (see Drawing 8). Since there is no signal from the Hi/Fifth output (Pin 6 of the CFG) signal is routed to both Pins 2 & 3 of the RFG IC23 from the Lo/Root output (Pin 7 of the CFG). This ensures a signal output at Pin 4 of the RFG no matter what state the RFG bass select circuit is in.

Under the above conditions, 5 signals are multiplexed to the bass Lo/Root output, Pin 7 of the CFG IC20. The multiplexer is controlled by a shift register. Each time a rhythm pulse is applied to Pin 37 of the CFG, from Pin 15 of the RFG, the shift register advances one position and outputs the next signal in the bass sequence. The signal is outputted at Pin 7 of the CFG, then routed through the rhythm tabs to Pins 2 & 3 of the RFG IC23. If a new keydown occurs before the bass sequence is complete, the shift register will reset to the starting point.

SCHEMATIC 8

RHYTHM CLOCK & INSTRUMENTATION

The Rhythm Function Generator (RFG) IC23 is the source of all Rhythm, Auto Bass and Chord Timing pulses. Pins 9 through 15 only have an output

when a Rhythm tabswitch is on and Pin 5 has a positive voltage applied to it. Pin 20 & 22 have a constant pulsating output which is never disabled and is used to drive the Percussion Modulator IC14 and Arpeggio Pulse Shaper IC19C, respectively. Turning on a Rhythm Tabswitch applies a positive voltage to the RFG. This enables the logic sequence for the rhythm chosen. Output pulses from Pins 9 - 15 are then routed to Instrumentation, Bass and Chord circuits in a specific sequence which creates the chosen rhythm pattern. The speed at which these pulses are delivered is controlled by the Rhythm Speed Control VR12.

PERCUSSION KEYING

Q91 REPEAT PERCUSSION MODULATOR DRIVER

Pin 20 of the RFG IC23 applies positive voltage pulses to the base of the Repeat Percussion Modulator Driver Q91. This repeatedly turns on Q91 creating a series of positive output pulses at its emitter. These positive output pulses are then routed to Pin 5 of the Percussion Modulator IC14 via the Percuss, Harmonic Flute, Mandolin and Banjo tabswitches where they gate signal through the modulator at the speed of the rhythm, and create the repeat effect for the Harmonic Flute, Mandolin and Banjo voices.

AUTO ACCOMPANIMENT KEYING

Q87 ACCOMPANIMENT MODULATOR DRIVER

Positive voltage pulses from Pin 10 or 14 of IC23 (depending on the position of the Boogie Woogie Bass tab) are applied to the base of Accompaniment Modulator Driver Q87, causing it to turn on. When Q87 turns on, it applies a positive voltage pulse to Pin 5 of IC16 gating the Accompaniment signal through IC16 at the speed of the rhythm. If no rhythm tabswitch is on, a steady positive voltage is routed through the rhythm tabs and Diode D109 to Pin 5 of IC16. This holds IC16 on and allows the Accompaniment signal to pass unmodulated. (Pin 14 of IC23 is also used to key the Block when the Latin Rhythm is on.)

BASS KEYING

Audio signals from Pins 6 & 7 of the CFG IC20 are applied to Pins 2 & 3 of the RFG IC23. Within IC23 is a select circuit which only allows one of these two signals to pass at any one time. The selected signal is then frequency divided in half and routed out of IC23 via Pin 4 to the base of Q89 Auto Bass Keyer.

Q89 & Q90 AUTO BASS KEYER & EMITTER FOLLOWER

Audio signal from Pin 4 of IC23 is applied to the base of Q89. This signal is passed and amplified by Q89 each time a positive voltage pulse from the Auto Bass Driver Q88 is applied to Q89's collector. This amplified signal is then applied to Q90 where it is transformed to a low impedance signal and routed via the bass tabswitches and string preamps to voicing and main preamp circuits.

Q88 AUTO BASS DRIVER

Positive voltage pulses from Pin 9 or 15 of IC23 (depending on the position of the Boogie Woogie Bass tab) are applied to the base of the Auto Bass Driver Q88, turning it on. This applies a positive voltage pulse to Auto Bass Keyer Q89 and enables audio signal to pass through Q89 for the duration of the pulse. If all rhythm tabswitches are off, a steady positive voltage is routed through the tabs and Diode D112 to Q89. This creates a constant path through Q89 and allows the low or root bass signal (depending on the mode of the CFG chip) to pass when there is no rhythm. Positive voltage pulses from Pin 9 & 15 of IC23 are also used to trigger the Strum and Boogie Woogie bass sequences.

RHYTHM INSTRUMENTATION

The instrument circuits Bongo, Block and Bass are tuned to a certain resonant frequency (by component values). The circuits are activated by positive pulses from the Rhythm Function Generator IC23 and act as tone generators producing the Bongo, Block and Bass Drum rhythm voices. These audio signals are then applied to the Instrument Preamp Q85.

Q85 INSTRUMENT PREAMP

Audio signals created by the Bass Drum, Bongo and Block circuits are applied to the Instrument Preamp where they are amplified before being applied to the Rhythm Preamp Q86.

SNARE NOISE & BRUSH KEYING

The Noise Generator IC24 creates a constant random noise signal, which is applied from Pin 3 to the cathodes of Diodes D101 and D102. This signal is keyed out by pulses from the Rhythm Function Generator and used for the snare and brush circuits.

Q60 SNARE NOISE VOICING AMP

When Pin 13 of IC23 is high, a positive voltage is applied to the anode of Diode D102. This allows noise

signal from IC24 to pass to the base of the Snare Voicing Amp Q84. Here the signal is voiced and amplified before being applied via the Rhythm Volume Control VR13 to the Rhythm Preamp.
NOTE: Pin 11 of IC23 will go high and key the Bongo Generator circuit at the same time Pin 13 goes high and keys the Snare Noise. The combination of these two audio signals gives the Snare Drum voice.

Q83 BRUSH VOICING AMP

When Pin 12 of IC23 is high, a positive voltage is applied through Diode D99 and charges a 1.4 uf capacitor. The discharge rate of this capacitor is controlled by positive voltage applied to the anode of Diode D98; the higher this voltage the longer the discharge time. The voltage from the discharging capacitor is applied to the anode of Diode D101. This allows noise signal from the Noise Generator IC24 to pass to the Brush Voicing Amp Q83 for the duration of discharge time, thus regulating the Rhythm Brush length. The signal is then amplified and voiced by the Brush Voicing Amp Q83, before being applied via the Rhythm Volume Control VR13, to the Rhythm Preamp Q86. When both the Country Western and Swing tabswitches are on, Diode D100 prevents cancellation of some bass and brush pulses.

RHYTHM PREAMP Q86

Audio signal from all Rhythm Instrumentation circuits is applied via the Rhythm Volume Control VR13 to the Rhythm Preamp. Here the rhythm signal is amplified before being routed to the String Bass Preamp Q60 and Leslie Preamp Q20.

SCHEMATIC 9

MAIN & LESLIE AMPLIFIERS

Q95-Q101 MAIN & LESLIE AMPLIFIERS

The Main and Leslie Amplifiers are identical. They are direct coupled with a quasi-complimentary output configuration. The power output is rated at 25 watts RMS for each amplifier. The function of the preamp is to boost the signal voltages to a point where they can be used by the driver and pre-driver circuits. The Differential Preamp senses the signal at the output of the amplifier and controls it by regulating the signal input at the preamp. The predriver inverts the audio voltages so that the drivers work in push-pull. The output transistors convert the audio voltages from the drivers into high-current, low-voltage output signal that is connected via the headphone jack to the speakers.

SCHEMATIC 10

POWER SUPPLY

AC line source voltage is converted into positive and negative DC supply voltages using Transformer T1 and Rectifier Bridge D118. Zener Diodes Z1-Z5 and Regulator Transistors Q103 & Q104 are used as voltage regulators on several voltage lines. Some of the voltage divider circuits are located on various boards throughout the organ. These circuits are shown enclosed in dotted lines with a note for their location. A 2-amp, Slo-Blo fuse is employed in the primary circuit of the power supply to prevent component damage which may be caused by a short circuit.

ADJUSTMENTS

VR1 VIBRATO SPEED ADJUSTMENT

Vibrato speed may be adjusted by using a small screwdriver. Proper speed is between 6-7 Hertz. The Vibrato Oscillator will not oscillate if adjustment is extreme.

VR2 HARMONICA ADJUSTMENT

This adjustment should be made for the best Harmonica effect. Too extreme an adjustment will cause a shallow Wow effect or loss of the Vibrato effect.

L1 TUNING COIL

This adjustment is carefully set at the factory. Should tuning be necessary, it is suggested a tuning fork for a certain note be used (C for example). By holding down a key (C for example), adjust the tuning coil with a non-metalic screwdriver until no roll or beat is heard between the organ note and fork tone. When this note is properly tuned, the TOS tuning is automatically locked in.

VR4 PERCUSSION THUMP ADJUSTMENT

The Percussion length is factory-set by component values. The purpose of the Percussion Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Banjo, Harmonic Flute or Mandolin voices. To adjust, set expression shoe on maximum. Turn on either the Mandolin, Harmonic Flute or Banjo tabs. Turn adjustment until minimum thump is heard. If thump cannot be reduced satisfactorily by adjustment, then replace Modulator IC.

VR7 ACCOMPANIMENT THUMP ADJUSTMENT

The Accompaniment length is factory-set by component values. The purpose of the Accompaniment Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Accompaniment voices. To adjust, turn on any rhythm and an accompaniment tabswitch (Piano, Guitar, Banjo), set rhythm volume at minimum and expression shoe at maximum. Turn adjustment until minimum thump is heard. If thump level cannot be reduced satisfactorily by adjustment, then replace Accompaniment Modulator IC.

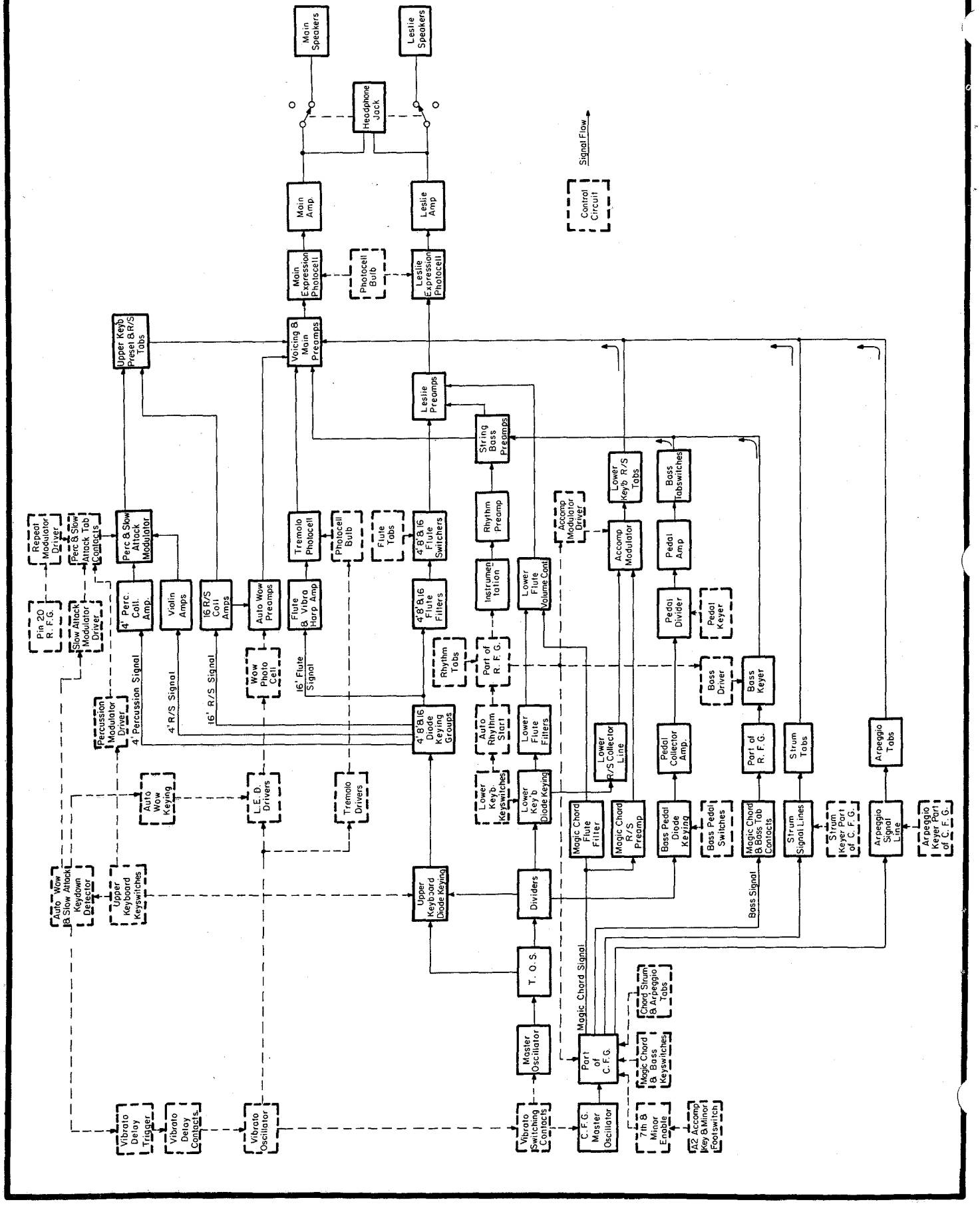
L16 CHORD TUNING COIL

First, tune L1 as described above. Then turn off the Magic Chord tab and all Rhythm tabs. Turn on only the Lower Keyboard String Bass voice and Upper Keyboard Horn voice. Now, holding a C on both the Upper and Lower Keyboards, adjust tuning coil L9 until no roll or beat is heard between the two notes. NOTE: When tuning, always make sure all vibrato and vibrato pre-set voices are off.

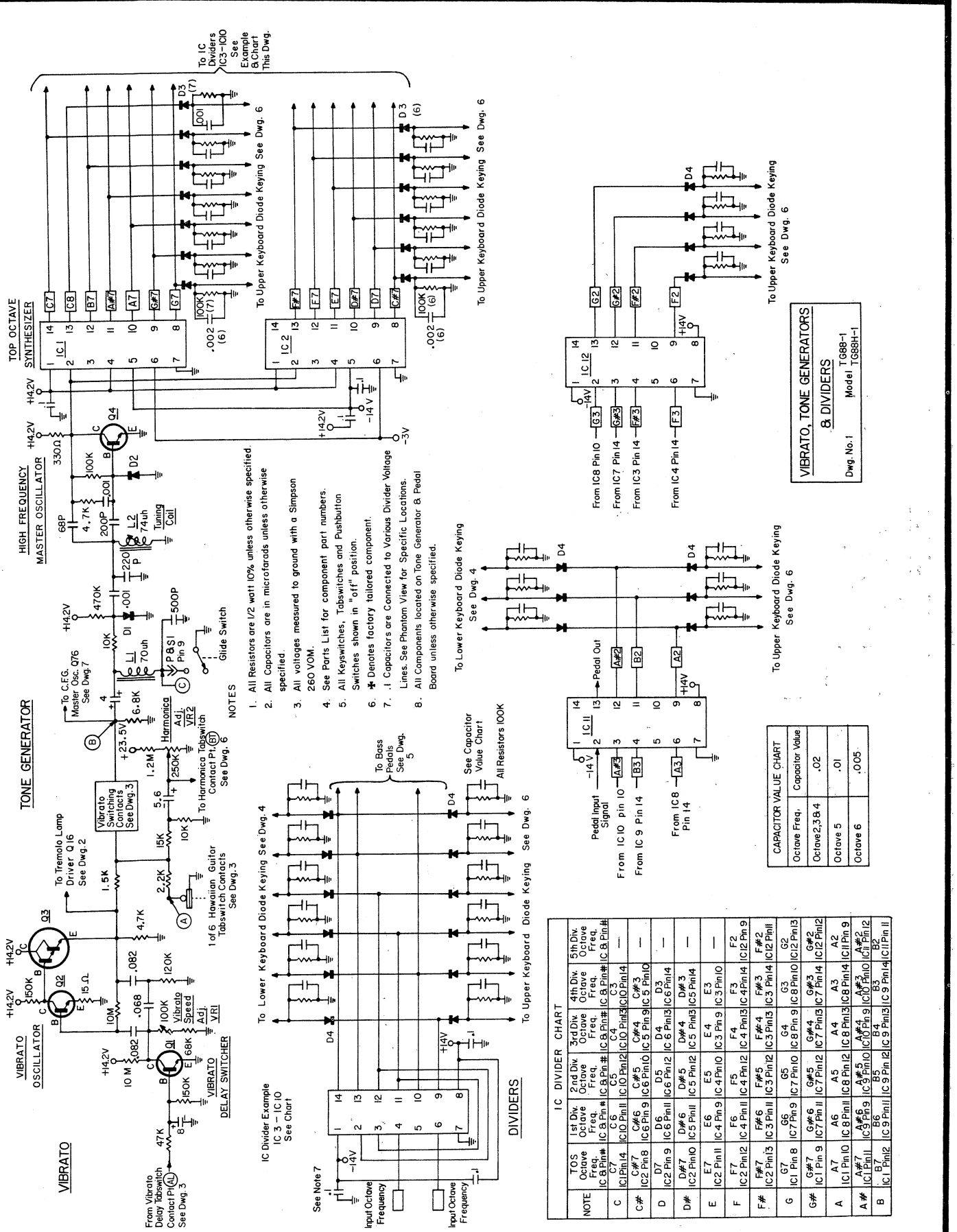
VR9 CHORD LEVEL ADJUSTMENT

With the Magic Chord tab off, hold a 3-note left-hand chord; switch the Magic Chord tab on and hold the same chord, but as a Genie one-note chord. Adjust VR9 until the volume level of the chord is the same with the Magic Chord tab on or off.

BLOCK DIAGRAM



SCHEMATIC 1


TONE GENERATOR
VIBRATO
VIBRATO OSCILLATOR
VIBRATO DELAY SWITCHER
HIGH FREQUENCY MASTER OSCILLATOR
TOP OCTAVE SYNTHESIZER
DIVIDERS
To Tremolo Lamp Driver Q16 See Dwg.2
Vibrato Switching Contacts See Dwg.3
To C.F.G. Master Osc. Q76 See Dwg.7
To Harmonica Tabswitch Contact Pt. (8) See Dwg. 6
1 of 6 Hawaiian Guitar Tabswitch Contacts See Dwg.3
Glide Switch
To Lower Keyboard Diode Keying See Dwg. 4
To Upper Keyboard Diode Keying See Dwg. 6
To Bass Pedals See Dwg. 5
See Capacitor Value Chart
All Resistors 100K
To IC Dividers IC3-IC10 See Example & Chart This Dwg.
From Vibrato Delay Tabswitch Contact Pt. (A) See Dwg. 3
IC Divider Example IC 3 - IC 10 See Chart
See Note 7
Input Octave Frequency
Pedal Input Signal
Pedal Out
From IC10 pin 10
From IC 9 Pin 14
From IC8 Pin 14
From IC8 Pin10
From IC7 Pin 14
From IC3 Pin 14
From IC4 Pin 14
NOTES
1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✠ Denotes factory tailored component.
7. .1 Capacitors are Connected to Various Divider Voltage Lines. See Phantom View for Specific Locations.
8. All Components located on Tone Generator & Pedal Board unless otherwise specified.
VIBRATO, TONE GENERATORS & DIVIDERS
Dwg. No. 1 Model TG88-1 TG88H-1

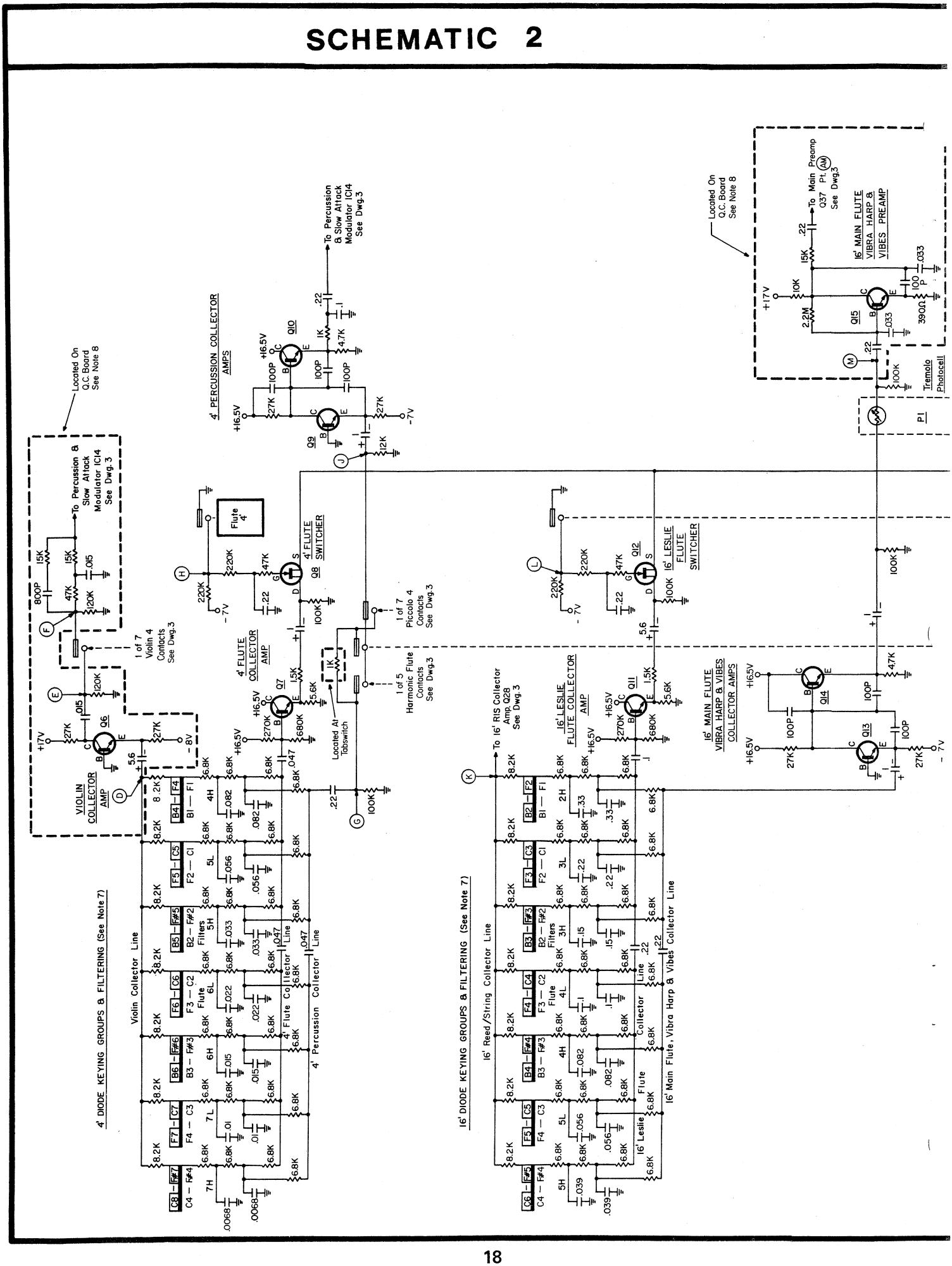
IC DIVIDER CHART

NOTE	TOS Octave Freq. IC 8 Pin#	1st Div. Octave Freq. IC 8 Pin#	2nd Div. Octave Freq. IC 8 Pin#	3rd Div. Octave Freq. IC 8 Pin#	4th Div. Octave Freq. IC 8 Pin#	5th Div. Octave Freq. IC 8 Pin#
C	C7 IC1 Pin 14	C6 IC10 Pin 11	C5 IC10 Pin 12	C4 IC10 Pin 13	C3 IC10 Pin 14	—
C#	C#7 IC2 Pin 8	C#6 IC6 Pin 9	C#5 IC6 Pin 10	C#4 IC5 Pin 9	C#3 IC5 Pin 10	—
D	D7 IC2 Pin 9	D6 IC6 Pin 11	D5 IC6 Pin 12	D4 IC6 Pin 13	D3 IC6 Pin 14	—
D#	D#7 IC2 Pin 10	D#6 IC5 Pin 11	D#5 IC5 Pin 12	D#4 IC5 Pin 13	D#3 IC5 Pin 14	—
E	E7 IC2 Pin 11	E6 IC4 Pin 9	E5 IC4 Pin 10	E4 IC3 Pin 9	E3 IC3 Pin 10	—
F	F7 IC2 Pin 12	F6 IC4 Pin 11	F5 IC4 Pin 12	F4 IC4 Pin 13	F3 IC4 Pin 14	F2 IC12 Pin 9
F#	F#7 IC2 Pin 13	F#6 IC3 Pin 11	F#5 IC3 Pin 12	F#4 IC3 Pin 13	F#3 IC3 Pin 14	F#2 IC12 Pin11
G	G7 IC1 Pin 8	G6 IC7 Pin 9	G5 IC7 Pin 10	G4 IC8 Pin 9	G3 IC8 Pin 10	G2 IC12 Pin13
G#	G#7 IC1 Pin 9	G#6 IC7 Pin 11	G#5 IC7 Pin 12	G#4 IC7 Pin 13	G#3 IC7 Pin 14	G#2 IC12 Pin12
A	A7 IC1 Pin 10	A6 IC8 Pin 11	A5 IC8 Pin 12	A4 IC8 Pin 13	A3 IC8 Pin 14	A2 IC11 Pin 9
A#	A#7 IC1 Pin 11	A#6 IC9 Pin 9	A#5 IC9 Pin 10	A#4 IC10 Pin 9	A#3 IC10 Pin 10	A#2 IC11 Pin 12
B	B7 IC1 Pin 12	B6 IC9 Pin 11	B5 IC9 Pin 12	B4 IC9 Pin 13	B3 IC9 Pin 14	B2 IC11 Pin 11

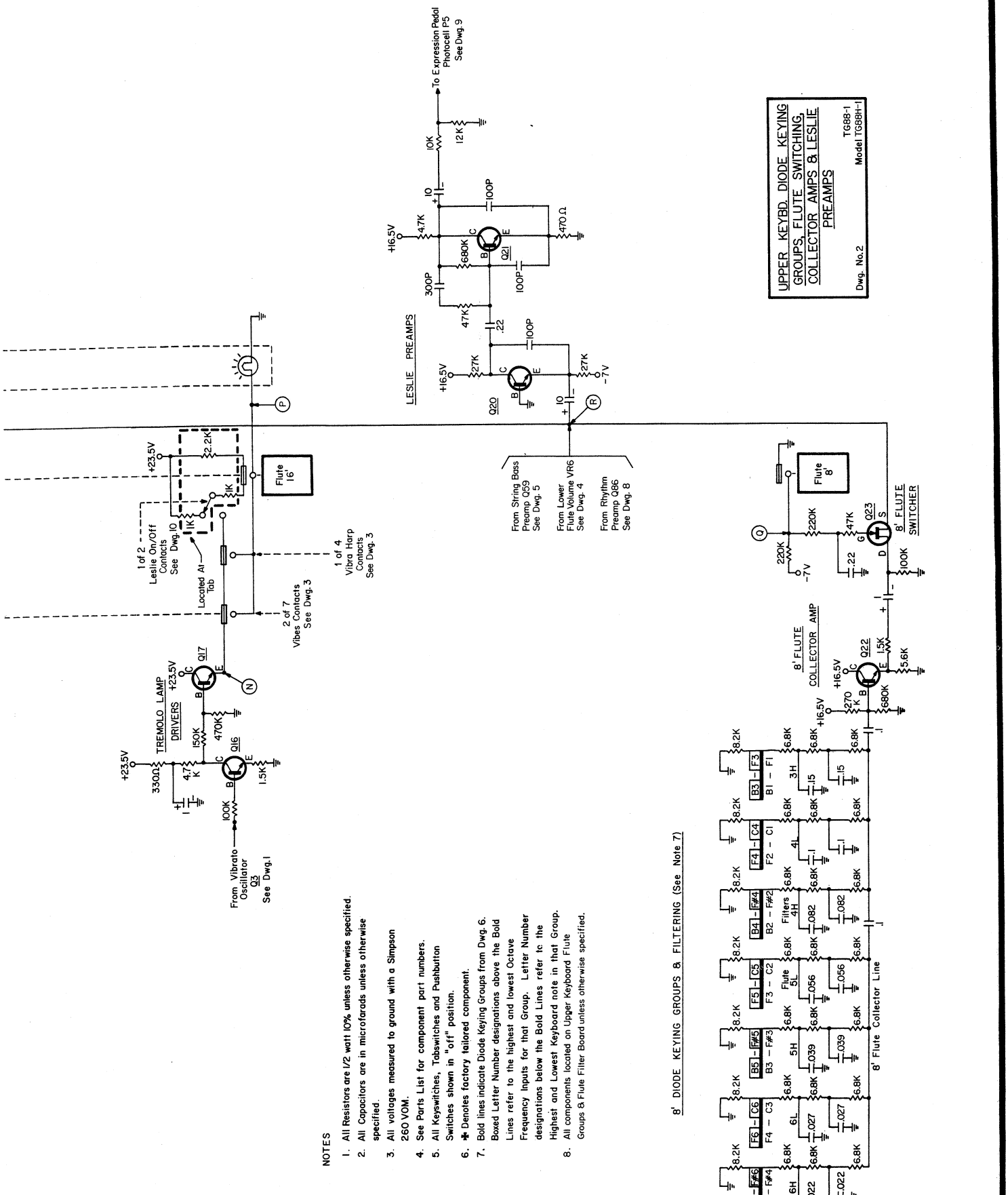
CAPACITOR VALUE CHART

Octave Freq.	Capacitor Value
Octave 2, 3 & 4	.02
Octave 5	.01
Octave 6	.005

SCHEMATIC 2


4' DIODE KEYING GROUPS & FILTERING (See Note 7)
16' DIODE KEYING GROUPS & FILTERING (See Note 7)
VIOLIN COLLECTOR AMP
4' FLUTE COLLECTOR AMP
4' FLUTE SWITCHER
4' PERCUSSION COLLECTOR AMPS
16' LESLIE FLUTE COLLECTOR AMP
16' LESLIE FLUTE SWITCHER
16' MAIN FLUTE VIBRA HARP & VIBES COLLECTOR AMPS
16' MAIN FLUTE VIBRA HARP & VIBES PREAMP
Located On Q.C. Board See Note 8
To Percussion & Slow Attack Modulator IC14 See Dwg.3
To Main Preamp Q37 Pt. (AM) See Dwg.3
1 of 7 Violin 4 Contacts See Dwg.3
1 of 7 Piccolo 4 Contacts See Dwg.3
1 of 5 Harmonic Flute Contacts See Dwg.3
Located At Tabswitch
To 16' R15 Collector Amp. Q28 See Dwg.3
Violin Collector Line
4' Flute Collector Line
4' Percussion Collector Line
16' Reed/String Collector Line
16' Main Flute, Vibra Harp & Vibes Collector Line
16' Leslie Flute Collector Line
Tremolo Photocell
P1

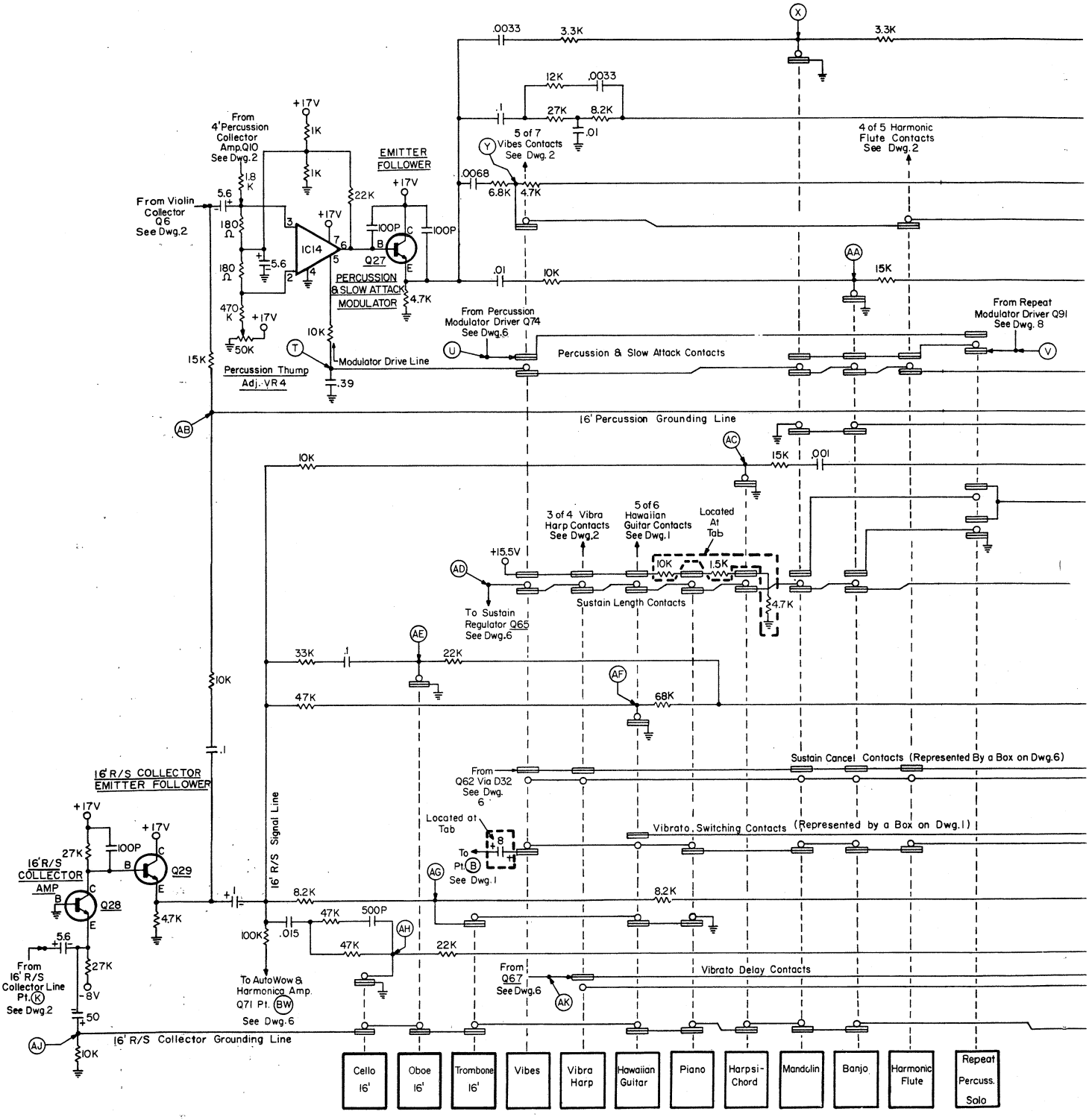
SCHEMATIC 2



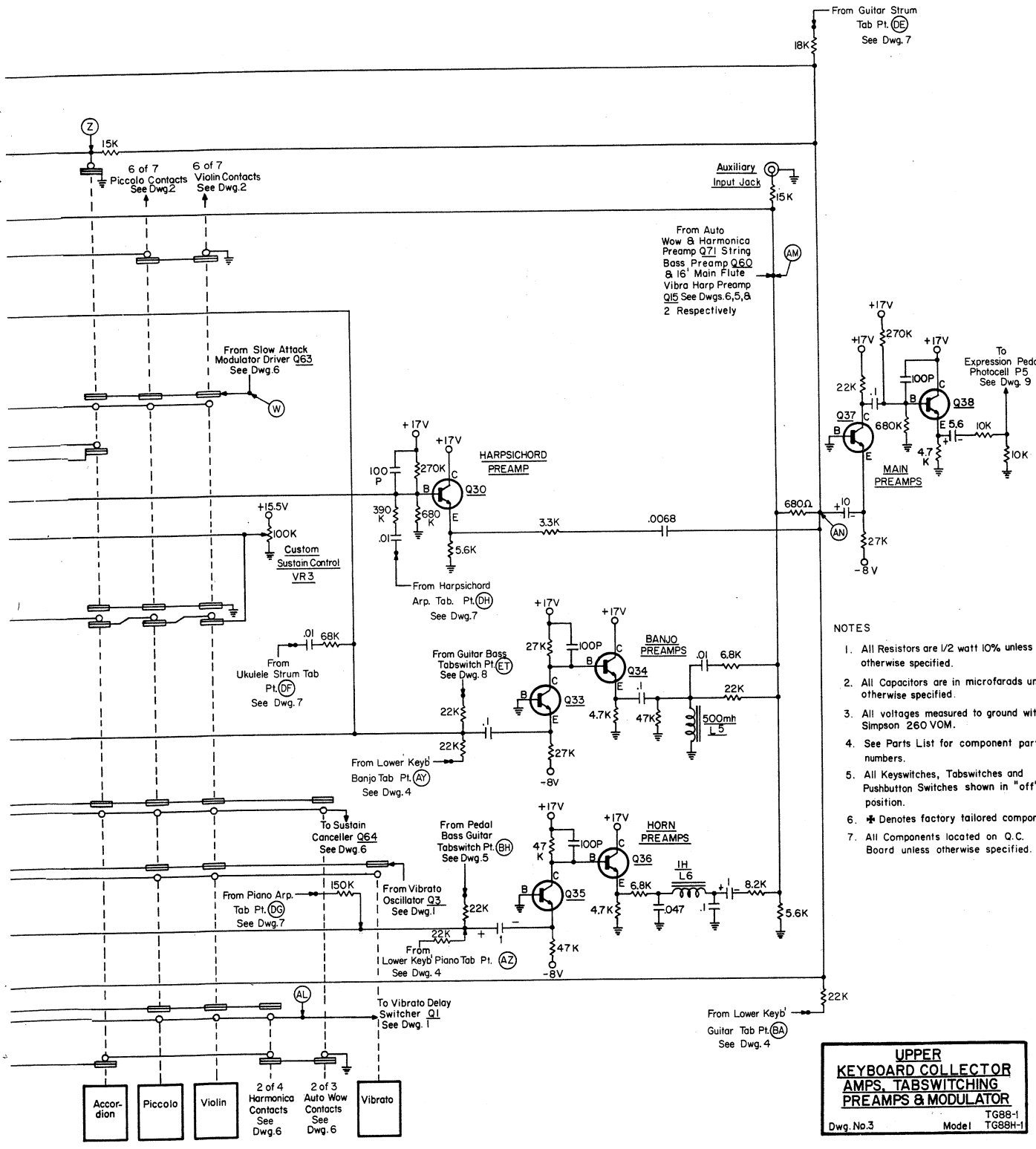
NOTES

1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. Bold lines indicate Diode Keying Groups from Dwg. 6. Boxed Letter Number designations above the Bold Lines refer to the highest and lowest Octave Frequency Inputs for that Group. Letter Number designations below the Bold Lines refer to the Highest and Lowest Keyboard note in that Group.
8. All components located on Upper Keyboard Flute Groups & Flute Filter Board unless otherwise specified.

SCHEMATIC 3


From 4' Percussion Collector Amp. Q10 See Dwg. 2
From Violin Collector Q6 See Dwg. 2
EMITTER FOLLOWER
IC14
Q27
PERCUSSION & SLOW ATTACK MODULATOR
Percussion Thump Adj. VR4
Modulator Drive Line
From Percussion Modulator Driver Q74 See Dwg. 6
From Repeat Modulator Driver Q91 See Dwg. 8
Percussion & Slow Attack Contacts
5 of 7 Vibes Contacts See Dwg. 2
4 of 5 Harmonic Flute Contacts See Dwg. 2
16' Percussion Grounding Line
3 of 4 Vibra Harp Contacts See Dwg. 2
5 of 6 Hawaiian Guitar Contacts See Dwg. 1
Located At Tab
Sustain Length Contacts
To Sustain Regulator Q65 See Dwg. 6
Sustain Cancel Contacts (Represented By a Box on Dwg. 6)
From Q62 Via D32 See Dwg. 6
Vibrato Switching Contacts (Represented by a Box on Dwg. 1)
Located at Tab
To Pt. B See Dwg. 1
16' R/S COLLECTOR EMITTER FOLLOWER
16' R/S COLLECTOR AMP
Q28
Q29
16' R/S Signal Line
From 16' R/S Collector Line Pt. K See Dwg. 2
To AutoWow & Harmonica Amp. Q71 Pt. BW See Dwg. 6
From Q67 See Dwg. 6
Vibrato Delay Contacts
16' R/S Collector Grounding Line
Cello 16'
Oboe 16'
Trombone 16'
Vibes
Vibra Harp
Hawaiian Guitar
Piano
Harpsi-Chord
Mandolin
Banjo
Harmonic Flute
Repeat Percuss. Solo

SCHEMATIC 3



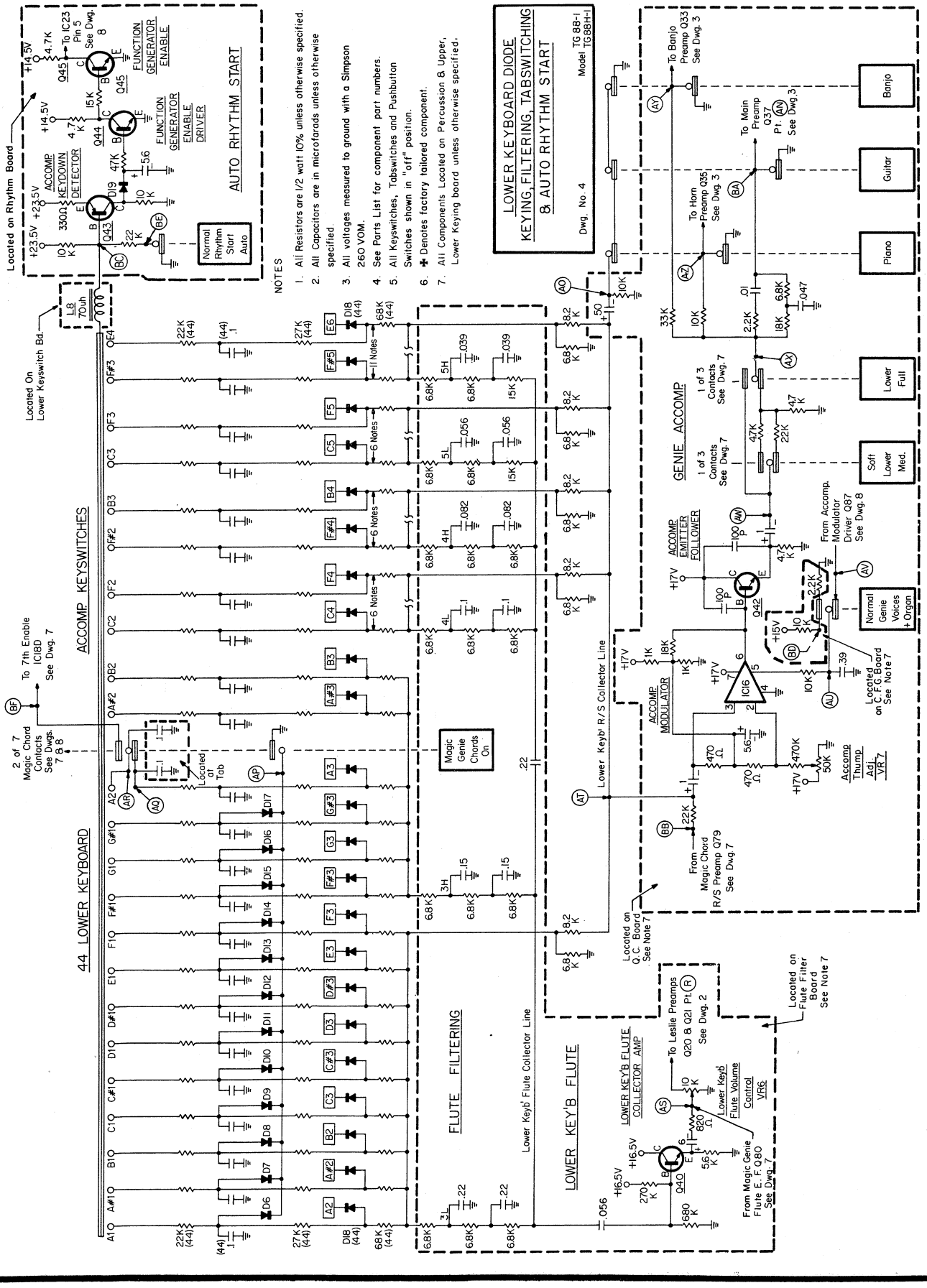
NOTES

1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✠ Denotes factory tailored component.
7. All Components located on Q.C. Board unless otherwise specified.

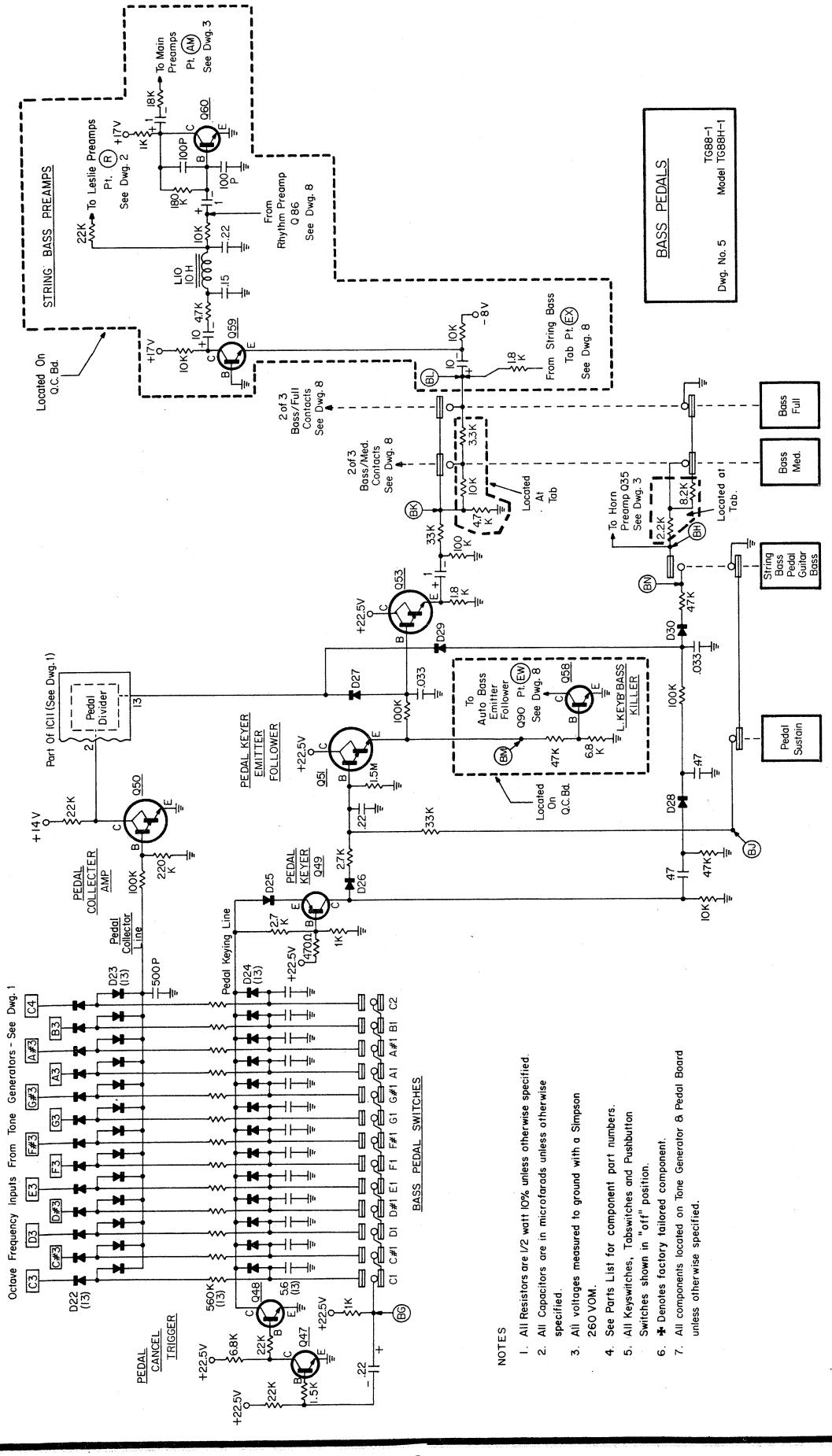
UPPER KEYBOARD COLLECTOR AMPS, TABSWITCHING PREAMPS & MODULATOR

Dwg. No.3 Model TG88-1 TG88H-1

SCHEMATIC 4


LOWER KEYBOARD DIODE KEYING, FILTERING, TABSWITCHING & AUTO RHYTHM START
Dwg. No. 4
Model TG 88-1 TG88H-1
NOTES
1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✣ Denotes factory tailored component.
7. All Components Located on Percussion & Upper, Lower Keying board unless otherwise specified.
AUTO RHYTHM START
Located on Rhythm Board
ACCOMP KEYDOWN DETECTOR
FUNCTION GENERATOR ENABLE
FUNCTION GENERATOR ENABLE DRIVER
Normal Rhythm Start Auto
Located On Lower Keyswitch Bd.
ACCOMP KEYSWITCHES
44 LOWER KEYBOARD
To 7th Enable IC18D See Dwg. 7
2 of 7 Magic Chord Contacts See Dwgs. 7 & 8
Located at Tab
Magic Genie Chords On
FLUTE FILTERING
Lower Keyb' Flute Collector Line
LOWER KEY'B FLUTE
LOWER KEY'B FLUTE COLLECTOR AMP
To Leslie Preamps Q20 & Q21 Pt. (R) See Dwg. 2
Lower Keyb Flute Volume Control VR6
From Magic Genie Flute E. F. Q80 See Dwg. 7
Located on Flute Filter Board See Note 7
Lower Keyb' R/S Collector Line
Located on Q.C. Board See Note 7
From Magic Chord R/S Preamp Q79 See Dwg. 7
ACCOMP MODULATOR
IC16
ACCOMP EMITTER FOLLOWER
Q42
From Accomp. Modulator Driver Q87 See Dwg. 8
Located on C.F.G. Board See Note 7
Accomp Thump Adj. VR7
GENIE ACCOMP
1 of 3 Contacts See Dwg. 7
To Horn Preamp Q35 See Dwg. 3
To Banjo Preamp Q33 See Dwg. 3
To Main Preamp Q37 Pt. (AN) See Dwg. 3
Banjo
Guitar
Piano
Lower Full
Soft Lower Med.
Normal Genie Voices + Organ

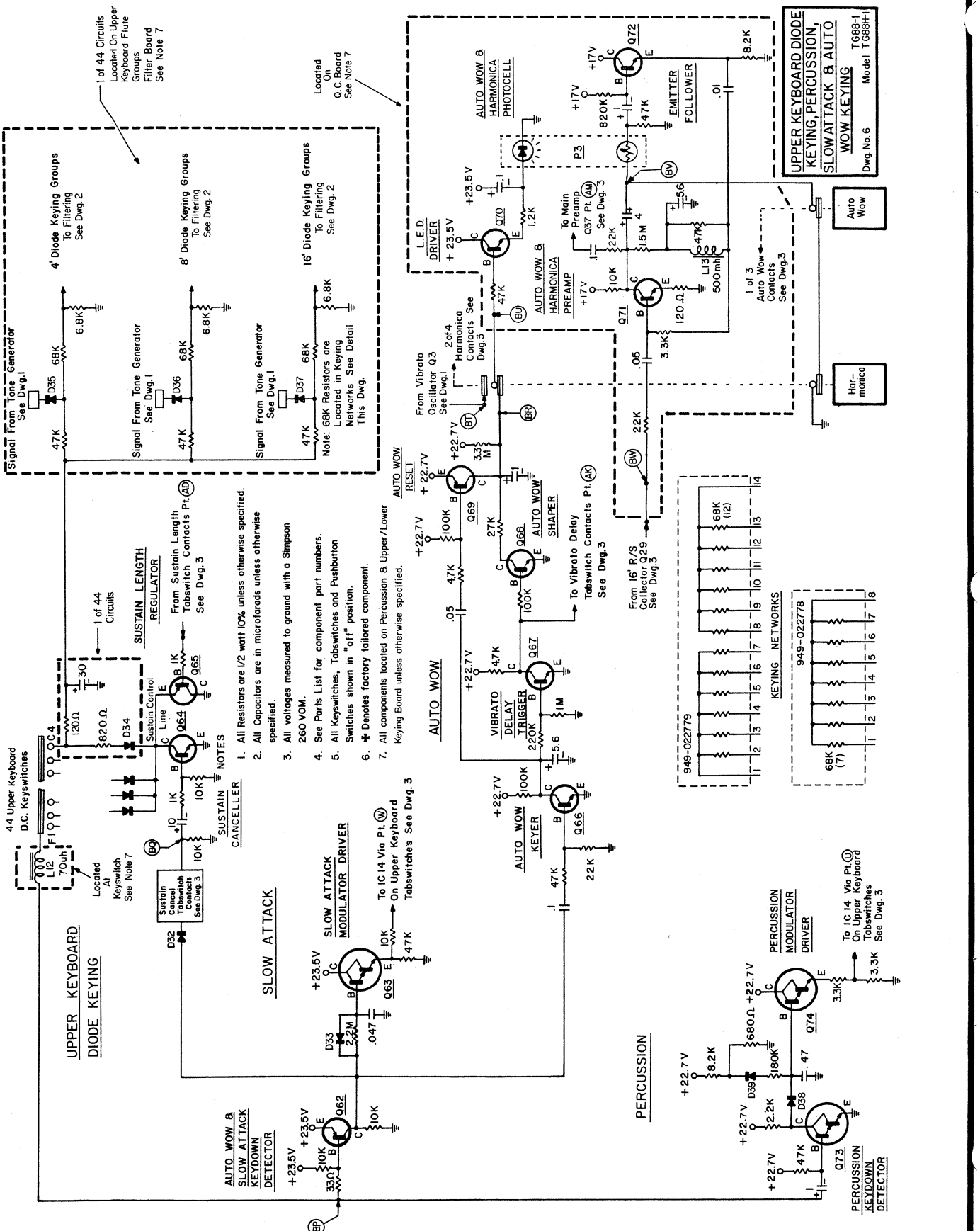
SCHEMATIC 5


STRING BASS PREAMPS
BASS PEDALS
Dwg. No. 5
TG88-1
Model TG88H-1
To Leslie Preamps Pt. (R) See Dwg. 2
To Main Preamps Pt. (AM) See Dwg. 3
From Rhythm Preamp Q 86 See Dwg. 8
Located On Q.C. Bd.
From String Bass Tab Pt. (EX) See Dwg. 8
2 of 3 Bass/Full Contacts See Dwg. 8
2 of 3 Bass/Med. Contacts See Dwg. 8
Located At Tab
To Horn Preamp Q35 See Dwg. 3
Located at Tab.
Bass Full
Bass Med.
String Bass Pedal Guitar Bass
Pedal Sustain
To Auto Bass Emitter Follower Q90 Pt. (EW) See Dwg. 8
L KEYB BASS KILLER
Located On Q.C. Bd.
Part Of IC11 (See Dwg. 1)
Pedal Divider
PEDAL KEYER EMITTER FOLLOWER
PEDAL COLLECTER AMP
PEDAL KEYER Q49
Pedal Collector Line
Pedal Keying Line
PEDAL CANCEL TRIGGER
Octave Frequency Inputs From Tone Generators - See Dwg. 1
C3 D3 D#3 E3 F3 F#3 G3 G#3 A3 A#3 B3 C4
C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1 C2
BASS PEDAL SWITCHES

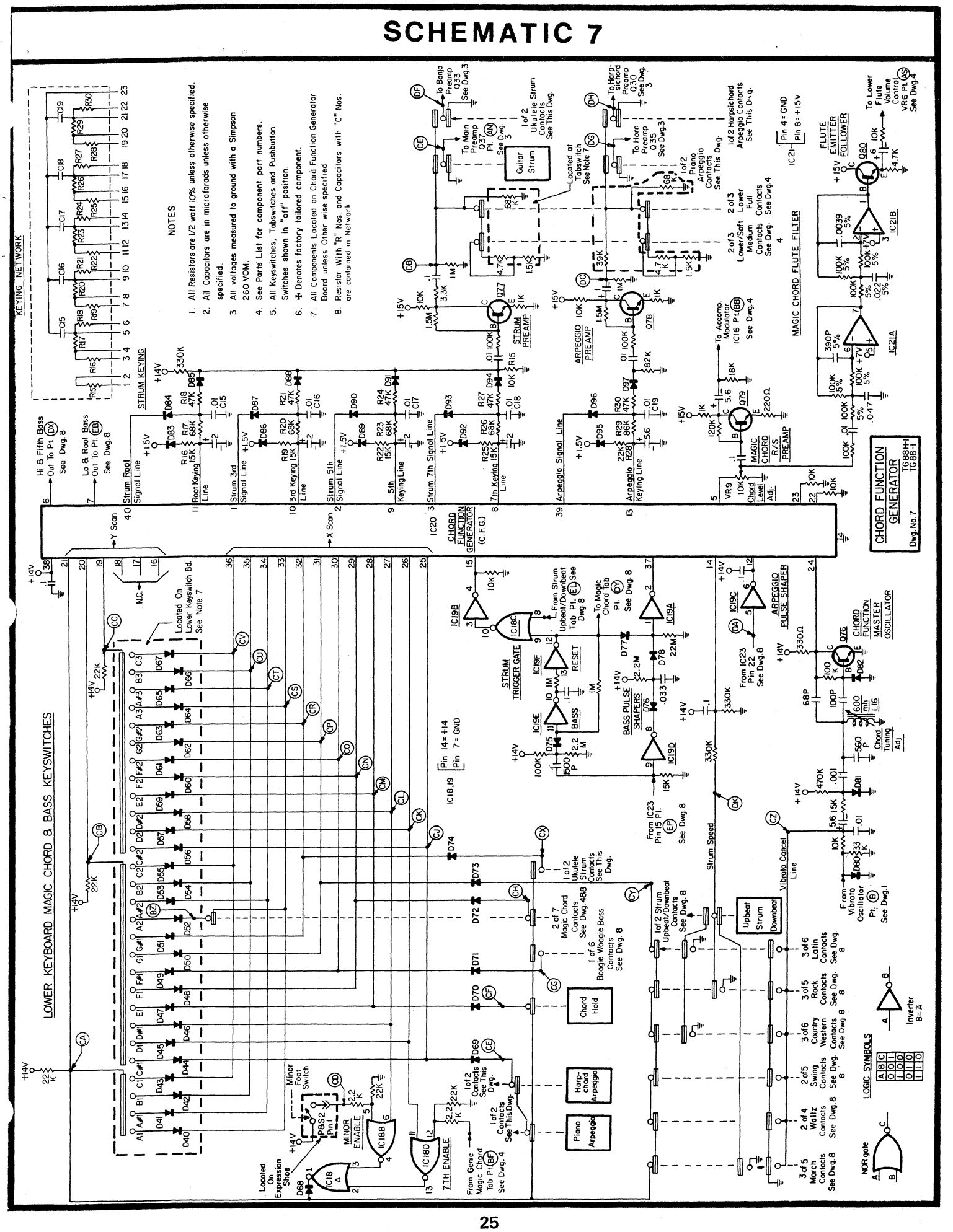
NOTES

1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✱ Denotes factory tailored component.
7. All components located on Tone Generator & Pedal Board unless otherwise specified.

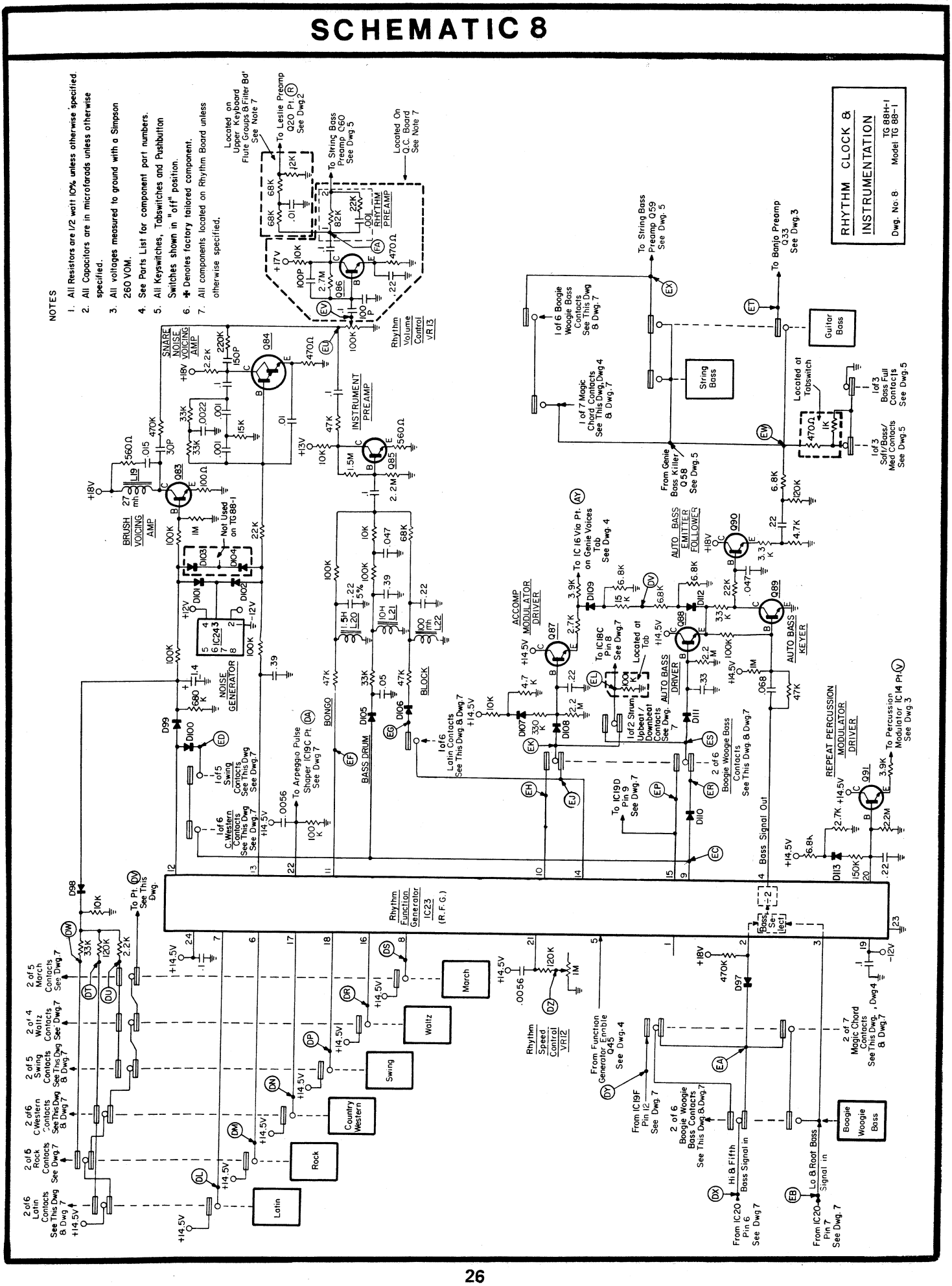
SCHEMATIC 6


UPPER KEYBOARD DIODE KEYING, PERCUSSION, SLOW ATTACK & AUTO WOW KEYING
Dwg No. 6 Model T688-1 T688H-1
UPPER KEYBOARD DIODE KEYING
SLOW ATTACK
AUTO WOW & SLOW ATTACK KEYDOWN DETECTOR
AUTO WOW
PERCUSSION
PERCUSSION KEYDOWN DETECTOR
SUSTAIN LENGTH REGULATOR
SUSTAIN CANCELLER
SLOW ATTACK MODULATOR DRIVER
AUTO WOW KEYER
VIBRATO DELAY TRIGGER
AUTO WOW SHAPER
AUTO WOW RESET
PERCUSSION MODULATOR DRIVER
AUTO WOW & HARMONICA PREAMP
AUTO WOW & HARMONICA PHOTOCELL
L.E.D. DRIVER
EMITTER FOLLOWER
KEYING NETWORKS
949-022779
949-022778
44 Upper Keyboard D.C. Keyswitches
Located At Keyswitch See Note 7
Sustain Cancel Tabswitch Contacts See Dwg. 3
1 of 44 Circuits
1 of 44 Circuits Located On Upper Keyboard Flute Groups Filter Board See Note 7
Located On Q.C. Board See Note 7
4' Diode Keying Groups To Filtering See Dwg. 2
8' Diode Keying Groups To Filtering See Dwg. 2
16' Diode Keying Groups To Filtering See Dwg. 2
Signal From Tone Generator See Dwg. 1
Note: 68K Resistors are Located in Keying Networks See Detail This Dwg.
From Sustain Length Tabswitch Contacts Pt. (AD) See Dwg. 3
To IC 14 Via Pt. (W) On Upper Keyboard Tabswitches See Dwg. 3
To IC 14 Via Pt. (U) On Upper Keyboard Tabswitches See Dwg. 3
From Vibrato Oscillator Q3 See Dwg. 1
2 of 4 Harmonica Contacts See Dwg. 3
To Vibrato Delay Tabswitch Contacts Pt. (AK) See Dwg. 3
From 16' R/S Collector Q29 See Dwg. 3
To Main Preamp Q37 Pt. (AM) See Dwg. 3
1 of 3 Auto Wow Contacts See Dwg. 3
Auto Wow
Har-monica
NOTES
1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✤ Denotes factory tailored component.
7. All components located on Percussion & Upper/Lower Keying Board unless otherwise specified.

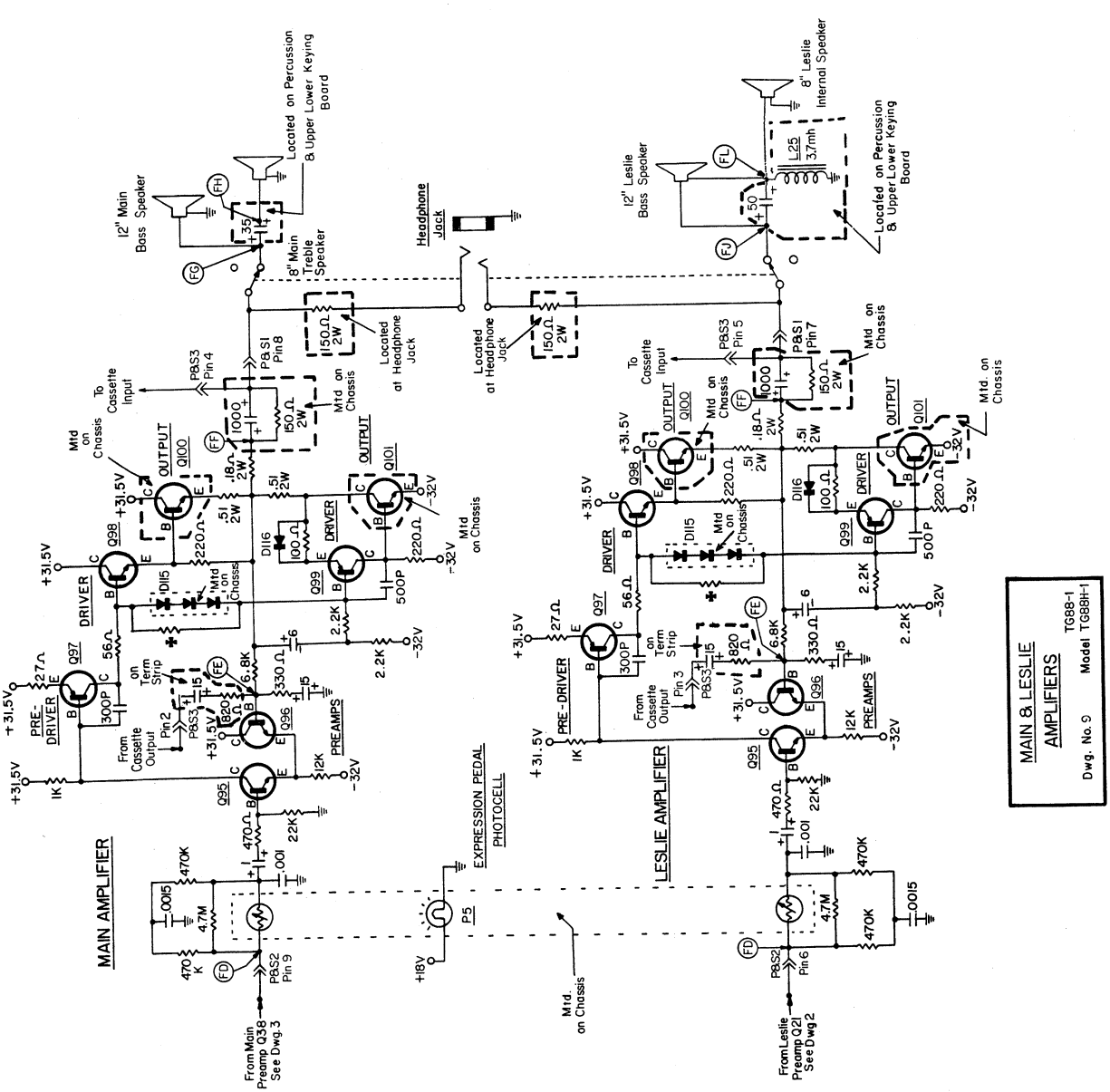
SCHEMATIC 7


KEYING NETWORK
NOTES
1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✠ Denotes factory tailored component.
7. All Components Located on Chord Function Generator Board unless Other wise specified
8. Resistor With "R" Nos. and Capacitors with "C" Nos. are contained in Network
STRUM KEYING
Strum Root Signal Line
Strum 3rd Signal Line
Strum 5th Signal Line
Strum 7th Signal Line
Arpeggio Signal Line
Root Keying Line
3rd Keying Line
5th Keying Line
7th Keying Line
Arpeggio Keying Line
Hi & Fifth Bass Out To Pt. (DX) See Dwg.8
Lo & Root Bass Out To Pt. (EB) See Dwg.8
CHORD FUNCTION GENERATOR (C.F.G.)
IC20
Y Scan
X Scan
CHORD FUNCTION GENERATOR Dwg. No. 7 TG88-1
MAGIC CHORD FLUTE FILTER
ARPEGGIO PREAMP
STRUM PREAMP
MAGIC CHORD R/S PREAMP
FLUTE EMITTER FOLLOWER
To Banjo Preamp Q33 See Dwg.3
To Main Preamp Q37 Pt. (AN) See Dwg 3
To Harp Guitar Preamp Q30 See Dwg. 3
To Horn Preamp Q35 See Dwg.3
To Accomp. Modulator IC16 Pt.(BB) See Dwg.4
To Lower Flute Volume Control VR6 Pt. (AS) See Dwg.4
Guitar Strum
1 of 2 Ukulele Strum Contacts See This Dwg.
Located at Tabswitch See Note 7
1 of 2 Piano Arpeggio Contacts See This Dwg.
1 of 2 Harpsichord Arpeggio Contacts See This Dwg.
2 of 3 Lower/Soft Medium Full Contacts See Dwg. 4
Pin 4 = GND
Pin 8 = +15V
LOWER KEYBOARD MAGIC CHORD & BASS KEYSWITCHES
Located On Lower Keyswitch Bd. See Note 7
Minor Foot Switch
PBS2 Pin 1
MINOR ENABLE
7TH ENABLE
Located On Expression Shoe
From Gene Magic Chord Tab Pt. (BF) See Dwg. 4
1 of 2 Contacts See This Dwg.
Chord Hold
Harpchord Arpeggio
Piano Arpeggio
2 of 7 Magic Chord Contacts See Dwg. 4&8
1 of 6 Boogie Woogie Bass Contacts See Dwg. 8
1 of 2 Ukulele Strum Contacts See This Dwg.
1 of 2 Strum Upbeat/Downbeat Contacts See Dwg. 8
Upbeat Strum Downbeat
Strum Speed
Vibrato Cancel Line
From Vibrato Oscillator Pt. (B) See Dwg. 1
3 of 5 March Contacts See Dwg. 8
2 of 4 Waltz Contacts See Dwg. 8
2 of 5 Swing Contacts See Dwg. 8
3 of 6 Country Western Contacts See Dwg. 8
3 of 5 Rock Contacts See Dwg. 8
3 of 6 Latin Contacts See Dwg. 8
STRUM TRIGGER GATE
From Strum Upbeat/Downbeat Tab Pt. (EL) See Dwg. 8
To Magic Chord Tab Pt. (CY) See Dwg. 8
BASS PULSE SHAPERS
From IC23 Pin 15 Pt. (EP) See Dwg. 8
From IC23 Pin 22 See Dwg. 8
ARPEGGIO PULSE SHAPER
CHORD FUNCTION MASTER OSCILLATOR
Chord Tuning Adj.
Pin 14 = +14 Pin 7 = GND
IC18, 19
LOGIC SYMBOLS
NOR gate
Inverter B=Ā

SCHEMATIC 8


NOTES
1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Rhythm Board unless otherwise specified.
RHYTHM CLOCK & INSTRUMENTATION
Dwg. No. 8 Model TG 88H-1 TG 88-1
Rhythm Function Generator IC23 (R.F.G.)
Rhythm Speed Control VR12
Rhythm Volume Control VR13
NOISE GENERATOR
BRUSH VOICING AMP
SNARE NOISE VOICING AMP
INSTRUMENT PREAMP
RHYTHM PREAMP
BASS DRUM BLOCK
BONGO
ACCOMP MODULATOR DRIVER
AUTO BASS KEYER
AUTO BASS DRIVER
AUTO BASS EMITTER FOLLOWER
REPEAT PERCUSSION MODULATOR DRIVER
Not Used on TG 88-1
Located on Upper Keyboard Flute Groups & Filter Bd' See Note 7
Located On Q.C. Board See Note 7
To Leslie Preamp Q20 Pt. (R) See Dwg 2
To String Bass Preamp Q60 See Dwg 5
To String Bass Preamp Q59 See Dwg. 5
To Banjo Preamp Q33 See Dwg.3
To Percussion Modulator IC14 Pt. (V) See Dwg 3
To Arpeggio Pulse Shaper IC19C Pt. (DA) See Dwg 7
To IC16 Via Pt. (AY) on Genie Voices Tab See Dwg 4
To IC18C Pin 8 See Dwg.7
To IC19D Pin 9 See Dwg.7
From Genie Bass Killer Q58 See Dwg.5
From Function Generator Enable Q45 See Dwg.4
From IC19F Pin 12 See Dwg 7
From IC20 Pin 6 See Dwg 7
From IC20 Pin 7 See Dwg. 7
Bass Signal Out
Bass Select
Hi & Fifth Bass Signal in
Lo & Root Bass Signal in
1 of 6 Boogie Woogie Bass Contacts See This Dwg & Dwg.7
1 of 7 Magic Chord Contacts See This Dwg, Dwg.4 & Dwg.7
1 of 6 Latin Contacts See This Dwg & Dwg.7
1 of 5 Swing Contacts See This Dwg See Dwg.7
1 of 6 C.Western Contacts See This Dwg See Dwg.7
1 of 2 Strum Upbeat / Downbeat Contacts See Dwg. 7
2 of 6 Boogie Woogie Bass Contacts See This Dwg & Dwg.7
2 of 7 Magic Chord Contacts See This Dwg & Dwg.7
1 of 3 Bass Full Contacts See Dwg.5
1 of 3 Soft Bass/ Med Contacts See Dwg.5
Located at Tabswitch
Guitar Bass
String Bass
Boogie Woogie Bass
Latin
Rock
Country Western
Swing
Waltz
March
2 of 6 Latin Contacts See This Dwg & Dwg 7
2 of 6 Rock Contacts See Dwg.7
2 of 6 C.Western Contacts See This Dwg & Dwg.7
2 of 5 Swing Contacts See This Dwg & Dwg.7
2 of 4 Waltz Contacts See Dwg.7
2 of 5 March Contacts See Dwg.7

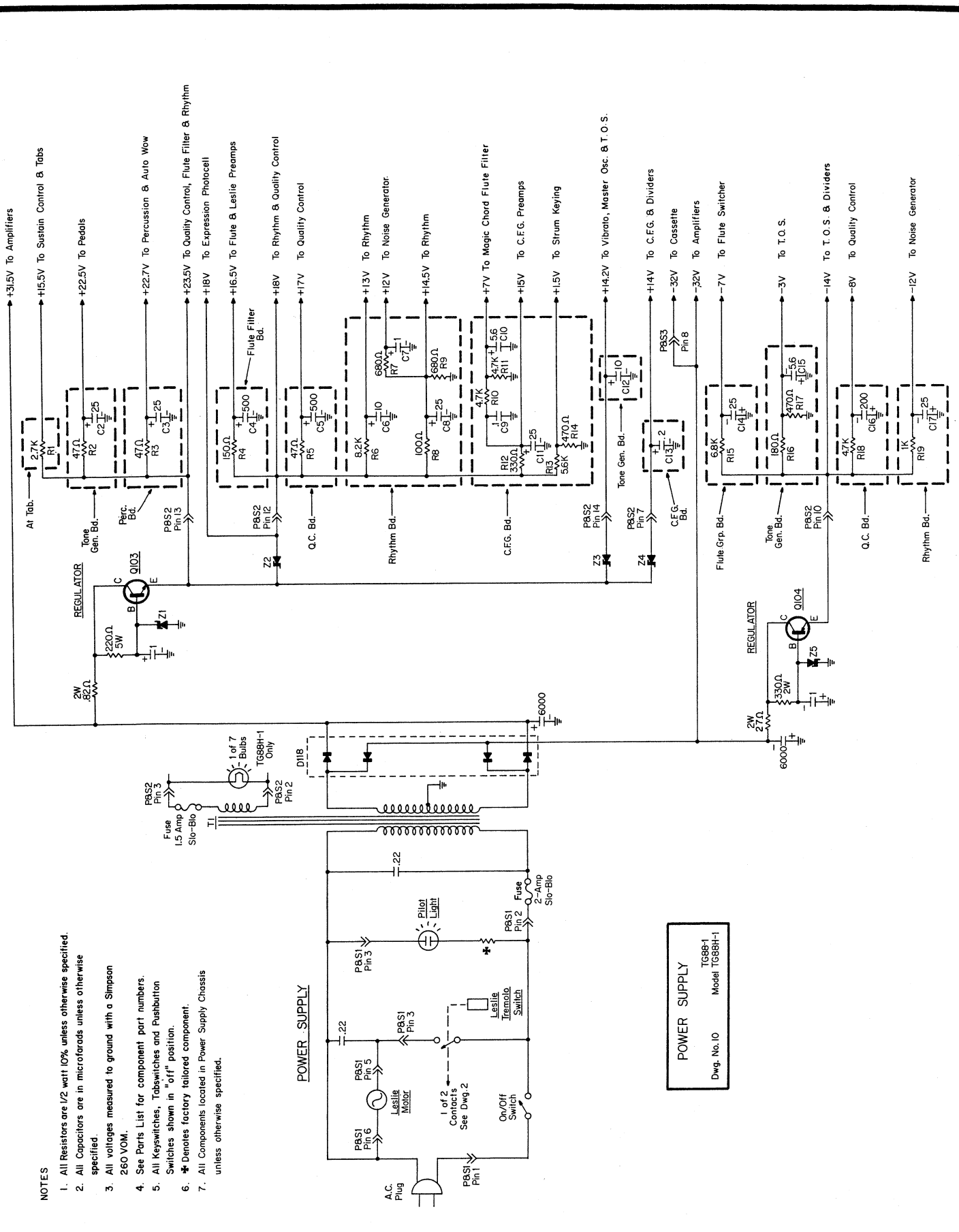
SCHEMATIC 9



NOTES

1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✤ Denotes factory tailored component.
7. All Components Located on Amplifier Boards unless otherwise specified.

SCHEMATIC 10



NOTES

1. All Resistors are 1/2 watt 10% unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✤ Denotes factory tailored component.
7. All Components located in Power Supply Chassis unless otherwise specified.

TRANSISTOR BASING DIAGRAM

FIG. A

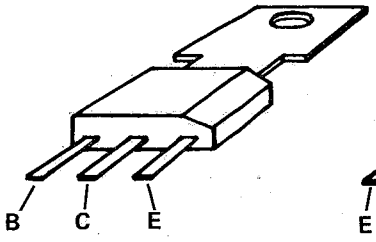


FIG. B

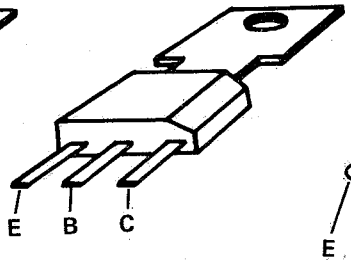


FIG. C

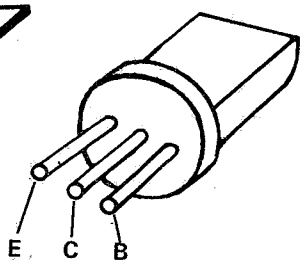


FIG. D

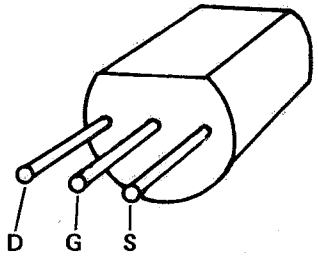


FIG. E

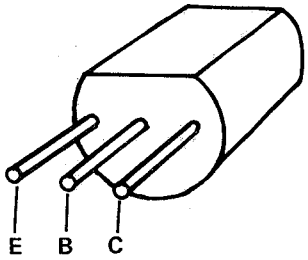


FIG. F

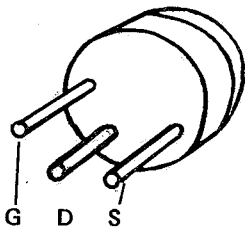


FIG. G

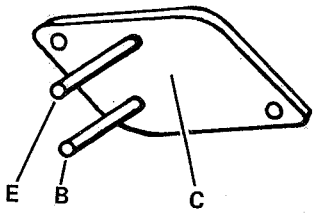


FIG.H

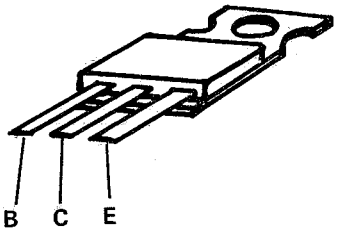


FIG.J

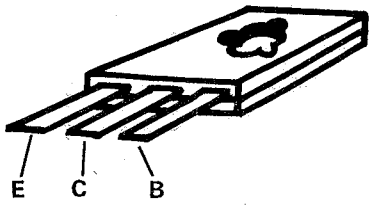


FIG.K

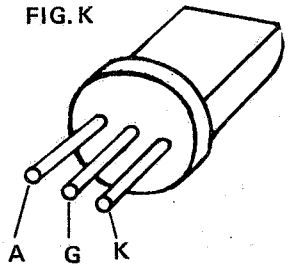


FIG. L

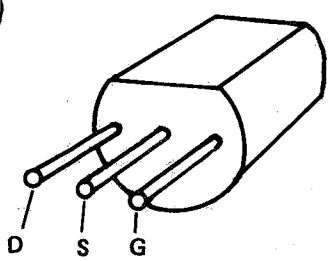
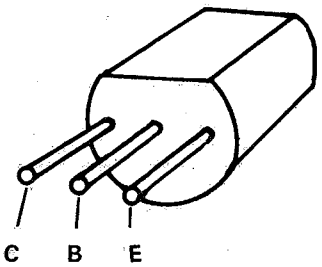


FIG.M



PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE
992-001192	G	991-012328	F	991-016727	C	992-024185	G
991-002232	C	991-012396	F	991-016788	C	991-024184	C
991-002271	G	991-012686	F	992-017169	G	991-025535	M
991-002298	C	992-013170	A	991-017456	F		
991-002356	C	991-013543	C	991-018238	C		
991-002873	C	991-013544	C	991-018047	E		
991-002888	C	991-013599	C	991-018237	B		
992-003139	G	991-015000	A	991-018493	E		
991-003304	C	991-015001	A	992-020432	G		
991-008393	C	991-015062	A	991-020425	H		
991-008394	C	991-015063	A	991-020426	H		
992-008890	G	991-015316	K	992-022201	G		
991-010098	C	991-015587	C	991-021451	J		
991-010462	C	991-015614	C	991-021450	J		
991-011576	D	991-015663	C	992-022773	G		
991-011706	D	991-016274	C	991-022774	L		

CHARTS

UPPER KEYBOARD FREQUENCY DISTRIBUTION CHART

DIVIDER	FREQUENCY OCTAVE IN HERTZ	4' VOICES	8' VOICES	16' VOICES
TOS	F7-2793	F4	-----	-----
1ST	F6-1396	F3	F4	-----
2ND	F5-698	F2	F3	F4
3RD	F4-349	F1	F2	F3
4TH	F3-174	-----	F1	F2
5TH	F2-87	-----	-----	F1
TOS	F#7-2960	F#4	-----	-----
1ST	F#6-1480	F#3	F#4	-----
2ND	F#5-739	F#2	F#3	F#4
3RD	F#4-369	F#1	F#2	F#3
4TH	F#3-185	-----	F#1	F#2
5TH	F#2-92	-----	-----	F#1
TOS	G7-3136	G4	-----	-----
1ST	G6-1568	G3	G4	-----
2ND	G5-783	G2	G3	G4
3RD	G4-392	G1	G2	G3
4TH	G3-196	-----	G1	G2
5TH	G2-97	-----	-----	G1
TOS	G#7-3322	G#4	-----	-----
1ST	G#6-1661	G#3	G#4	-----
2ND	G#5-830	G#2	G#3	G#4
3RD	G#4-415	G#1	G#2	G#3
4TH	G#3-207	-----	G#1	G#2
5TH	G#2-103	-----	-----	G#1
TOS	A7-3520	A4	-----	-----
1ST	A6-1760	A3	A4	-----
2ND	A5-880	A2	A3	A4
3RD	A4-440	A1	A2	A3
4TH	A3-220	-----	A1	A2
5TH	A2-110	-----	-----	A1
TOS	A#7-3729	A#4	-----	-----
1ST	A#6-1864	A#3	A#4	-----
2ND	A#5-932	A#2	A#3	A#4
3RD	A#4-466	A#1	A#2	A#3
4TH	A#3-233	-----	A#1	A#2
5TH	A#2-116	-----	-----	A#1

DIVIDER	FREQUENCY OCTAVE IN HERTZ	4' VOICES	8' VOICES	16' VOICES
TOS	B7-3951	B4	-----	-----
1ST	B6-1975	B3	B4	-----
2ND	B5-987	B2	B3	B4
3RD	B4-493	B1	B2	B3
4TH	B3-246	-----	B1	B2
5TH	B2-123	-----	-----	B1
TOS	C8-4186	C4	-----	-----
TOS	C7-2093	C3	C4	-----
1ST	C6-1046	C2	C3	C4
2ND	C5-523	C1	C2	C3
3RD	C4-261	-----	C1	C2
4TH	C3-130	-----	-----	C1
TOS	C#7-2217	C#3	-----	-----
1ST	C#6-1108	C#2	C#3	-----
2ND	C#5-554	C#1	C#2	C#3
3RD	C#4-277	-----	C#1	C#2
4TH	C#3-138	-----	-----	C#1
TOS	D7-2349	D3	-----	-----
1ST	D6-1174	D2	D3	-----
2ND	D5-587	D1	D2	D3
3RD	D4-293	-----	D1	D2
4TH	D3-146	-----	-----	D1
TOS	D#7-2489	D#3	-----	-----
1ST	D#6-1244	D#2	D#3	-----
2ND	D#5-622	D#1	D#2	D#3
3RD	D#4-311	-----	D#1	D#2
4TH	D#3-155	-----	-----	D#1
TOS	E7-2637	E3	-----	-----
1ST	E6-1318	E2	E3	-----
2ND	E5-659	E1	E2	E3
3RD	E4-329	-----	E1	E2
4TH	E3-164	-----	-----	E1

Letter-number designations under Voice headings refer to keyboard notes.

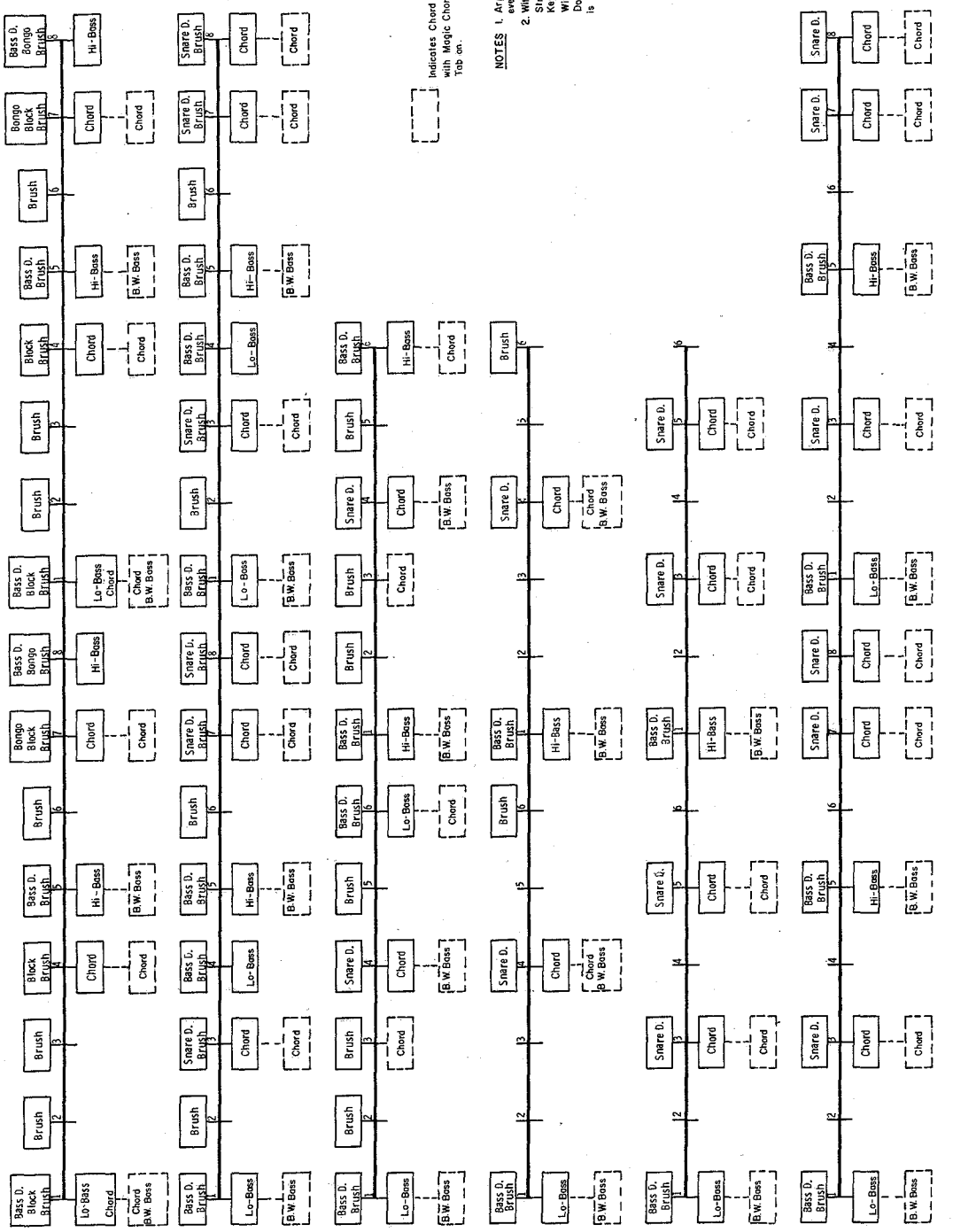
CHARTS

LOWER KEYBOARD FREQUENCY DISTRIBUTION CHART

DIVIDER	FREQUENCY OCTAVE IN HERTZ	LOWER MANUAL KEY
2ND	A5-880	A4
3RD	A4-440	A3
4TH	A3-220	A2
5TH	A2-110	A1
2ND	A#5-932	A#4
3RD	A#4-466	A#3
4TH	A#3-233	A#2
5TH	A#2-116	A#1
2ND	B5-987	B4
3RD	B4-493	B3
4TH	B3-246	B2
5TH	B2-123	B1
2ND	C6-1046	C4
3RD	C5-523	C3
4TH	C4-261	C2
5TH	C3-130	C1
1ST	C#6-1108	C#4
2ND	C#5-554	C#3
3RD	C#4-277	C#2
4TH	C#3-138	C#1
1ST	D6-1174	D4
2ND	D5-587	D3
3RD	D4-293	D2
4TH	D3-146	D1
1ST	D#6-1244	D#4
2ND	D#5-622	D#3
3RD	D#4-311	D#2
4TH	D#3-155	D#1
1ST	E6-1318	E4
2ND	E5-659	E3
3RD	E4-329	E2
4TH	E3-164	E1
2ND	F5-698	F3
3RD	F4-349	F2
4TH	F3-174	F1
2ND	F#5-739	F#3
3RD	F#4-369	F#2
4TH	F#3-185	F#1
2ND	G5-783	G3
3RD	G4-392	G2
4TH	G3-196	G1
2ND	G#5-830	G#3
3RD	G#4-415	G#2
4TH	G#3-207	G#1

Frequencies shown are with Bass & Magic Chord tabs off.

RHYTHM PATTERNS DIAGRAM


LATIN
ROCK
COUNTRY WESTERN
SWING
WALTZ
MARCH
Indicates Chord Bass Sequence with Magic Chord & Boogie Woogie Bass Tab on.
NOTES 1. Arpeggio is advanced on every Rhythm Time Point.
2. With the Up/beat Downbeat Strum Tab off, Strum is Keyed with the Chord Pulse. With the Up/beat Strum Downbeat Tab on the Strum is Keyed with the Bass Pulse

PARTS INFORMATION

STANDARD PARTS

Replacements for all standard electronic parts and hardware may be purchased directly from local suppliers generally in less time than would be required to obtain them from the factory.

SPECIAL PARTS

In addition to the standard replacement parts, special electronic and mechanical parts are also used. These parts are manufactured by and to the specifications of the factory. Order these parts directly from the factory since they would be difficult or impossible to obtain from other sources.

PARTS ORDERING INFORMATION

When ordering parts be sure to include the following information:

1. Model and Serial Number
2. Part Number
3. A description of the part
4. Specify how you want the part shipped.

Most special electronic parts and mechanical parts will have a part number stamped on them. In the event that the part number is missing, or you are unable to read the part number, a complete description of the part and where it is used will allow the factory to fill your parts order. When parts are ordered in the proper manner the factory is able to fill your orders promptly—delays that might result are avoided.

ADDRESS PARTS ORDERS TO:

LOWREY ELECTRONICS SERVICE DEPT.
4400 W. 45th St.
Chicago, Illinois 60632

IMPORTANT

IN ANY CORRESPONDENCE CONCERNING THIS INSTRUMENT ALWAYS INCLUDE MODEL AND SERIAL NUMBERS

PARTS LIST

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THE PARTS LIST CONTAINS THE FOLLOWING INFORMATION:

1. Name of Part
2. Value, Tolerance and Code (When Important)
3. Brief description
4. Where the part is found (assembly, printed circuit board, etc.)
5. Schematic Reference Number
6. PART NUMBER — USE IT!

This parts list includes all standard stock replacement parts. No attempt has been made to include every nut, bolt and screw. If the necessity for a non-listed part arises, please write describing the parts location and function as well as model and serial number of the unit.

PARTS LIST

Part	Description	Schematic Reference	Part Number
AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY			
Capacitor	Electrolytic 15 UF 6V		945-008895-079
Capacitor	Electrolytic 1 UF 25V NP		945-008895-041
Capacitor	Electrolytic 6 UF 20V		945-008895-007
Capacitor	Electrolytic 1 UF 35V NP		945-008895-015
Capacitor	Electrolytic 1000-1000 40V NP		945-022771
Capacitor	Electrolytic 6000 UF 40V		945-025571
Cord	Power		989-008717
Diffuser	White		922-015938-001
Diode	Rectifier 6 amps	D118	919-022736-003
Diode	Triple	D115	919-010454-001
Diode	Zener 5.1V	Z2	919-017406-022
Diode	Zener 9.1V 5%	Z3, 4	919-017406-026
Diode	Zener 14V 5%	Z5	919-017406-065
Diode	Zener 24V	Z1	919-017406-61
Diode		D116	919-010623
Fuse	2-Amp Pigtail Slo-Blo		939-001120-003
Fuse	1.5-Amp Pigtail Slo-Blo (TG88H-1 Only)		939-001120-005
Mat	Glide Switch		959-009208-003
Mat	Minor Switch		959-009208-004
Resistor	WW 27 Ohm 2W		924-008896-40
Resistor	WW .18 Ohm 10% 2W		924-008896-021
Resistor	WW .51 Ohm 10% 2W		924-015325-012
Resistor	WW 150 Ohm 10% 2W		924-010471-151
Resistor	WW 220 Ohm 10% 2W		924-010471-221
Resistor	WW 330 Ohm 10% 2W		924-010471-331
Resistor	Fusible .82 Ohm 2W		924-024557-001
Socket	Transistor		906-021455
Spring	Compression		975-011747-001
Spring	Glide Switch		975-022949
Switch	Minor & Glide		960-006340
Transformer	Power	T1	954-022722
Transformer	Power (TG88H-1 Only)	T1	954-022722-2
Transistor	Preamps	Q95, 96	991-013544
Transistor	PNP Pre-Driver	Q97	991-015614
Transistor	NPN Driver	Q98	991-021450-002
Transistor	PNP Regulator	Q104	992-022773
Transistor	Driver PNP	Q99	991-021451-002
Transistor	Output & Regulator NPN	Q100, 101, 103	992-022201
BASS PEDAL ASSEMBLY			
Assembly	Long Pedal		997-006405-005
Assembly	Short Pedal		997-006406
Cap	Dark Brown (Long Pedal)		915-003856
Cap	Black (Short Pedal)		915-003863
Spring	Compression		975-005811
Spring	Contact		917-009155

PARTS LIST

Part	Description	Schematic Reference	Part Number
CHORD FUNCTION GENERATOR BOARD ASSEMBLY			
Capacitor	Electrolytic 6 UF 20V		945-008895-007
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 25 UF 25V	C11	945-008895-008
Capacitor	Electrolytic 2x2 UF 30V		945-024186
Capacitor	Polystyrene 390 PF 5% 63V		946-024767-001
Capacitor	Polystyrene 560 PF 5% 63V		946-024767-002
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Coil	Chord Tuning Adjust.	L16	952-018874-005
Diode		D68-80, 83-97	919-024769
Diode	Low Capacity	D82	919-010873
Diode	Glide	D81	919-024117
IC	Minor & 7th Enable	IC18	991-025536
IC	Bass Pulse Shaper	IC19	991-025576
IC	Chord Function Generator	IC20	991-026003
IC	Magic Chord Flute Filter	IC21	991-025244
Network	23-Pin		949-024737
Potentiometer	10K 20% Chord Level Adjust.	VR9	925-004349-003
Socket	14-Pin	IC18 & IC19	906-018905
Socket	8-Pin	IC21	906-021448
Socket	40-Pin	IC20	906-022727
Transistor	Strum Arpeggio & Chord Preamps	D77-80	991-002298
Transistor	Chord Function Master Oscillator	Q76	991-025535
CONSOLE & MANUAL ASSEMBLIES			
Back	Console Walnut - Pecan		972-025508-001
Key Cap (1)	Plastic (Black)		
Key Cap (2)	Plastic (White)		
Key (3)	Complete (Black or White)		
Lamp	Frosted (TG88H-1 Only)		939-009987
Speaker	8-Inch Main		985-003185-3
Speaker	12-Inch Main & Leslie Bass		985-021082
LESLIE TREMOLO UNIT			
Assembly	Motor and Bracket		019638
Assembly	Motor with Pulley		019661
Belt			021048
Bushing	Black Rubber		019463
Drum	Styrene		019794
Shaft	Rotor with Pulley		019745
Speaker	8-inch 8-Ohm		010207

(1) All are identical.
(2) Include Key Letter designation. (Example: A or F, etc.)
(3) Available on special order only. Include Key Letter designation and Key location. Replacement keys will require special hand-fitting due to the hand-built construction of keyboards.

PARTS LIST

Part	Description	Schematic Reference	Part Number
LOWER KEYSWITCH BOARD ASSEMBLY			
Actuator	Keyswitch		964-024116
Coil	70 UH	L8	956-018877
Diode		D40-67	919-024769
Spring	Contact		917-009155
Spring	Pull Down		975-007085
PERCUSSION & UPPER/LOWER KEYING BOARD ASSEMBLY			
Capacitor	Crossover 50 UF 20V		945-022780
Capacitor	Crossover 35 UF 20V		945-022269
Capacitor	Electrolytic 25 UF 25V	C3	945-008895-008
Capacitor	Electrolytic 10 UF 20V		945-008895-009
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 2x30 UF 25V Dual		945-022781
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Capacitor	Tantalum 1.0 UF 35V		946-021452-002
Diode		D6-18, 32-34, 38, 39	919-024769
Transistor	Wow Reset	Q69	991-010098
Transistor	Sustain Cancel, Wow Keyer & Shaper	Q64, 66, 68	991-002232
Transistor	Vibrato Delay Trigger	Q67	991-008393
Transistor	Percussion & Slow Attack Modulator Drivers	Q63, 73, 74	991-016727
Transistor	Sustain Regulator & Detector	Q62, 65	991-020426-001
QUALITY CONTROL BOARD ASSEMBLY			
Capacitor	Electrolytic 500 UF 18V	C5	945-008895-080
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 10 UF 20V		945-008895-009
Capacitor	Electrolytic 50 UF 20V		945-008895-012
Capacitor	Electrolytic 200 UF 25V	C16	945-008895
Capacitor	Electrolytic 4 UF 35V NP		945-008895-016
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Coil	Toroid 10H String Bass Voicing	L10	952-021447-002
Coil	Toroid 500 MH Wow & Banjo Voicing	L5, 13	952-021447-008
Coil	Toroid 1H Horn Voicing	L6	952-021447-009
IC	Percussion & Accompaniment Modulator	IC14, 16	991-021444-001
Photocell	Auto Wow	P3	948-022248
Potentiometer	50K 20% Percussion & Accomp. Thump Adjust.	VR4, 7	925-004349-007
Socket	IC 8-Pin		906-021448
Transistor	Collector Amps Preamps	Q6,15,27-30,33-38,46, 59, 71, 72, 86	991-002298
Transistor	Killer	Q58	991-002232
Transistor	Preamp	Q60	991-008393
Transistor	LED Driver	Q70	991-018238

PARTS LIST

Part	Description	Schematic Reference	Part Number
RHYTHM BOARD ASSEMBLY			
Capacitor	Electrolytic 1.4 UF 15V		945-008895-004
Capacitor	Electrolytic 10 UF 20V	C6	945-008895-009
Capacitor	Electrolytic 1 UF 35V NP	C7	945-008895-015
Capacitor	Electrolytic 25 UF 25V	C8, C17	945-008895-008
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Coil	Toroid 1.5 H Bongo	L20	952-021447-003
Coil	Toroid 10 H Bass Drum	L21	952-021447-002
Coil	Toroid 100 mh Block	L22	952-021447-005
Coil	27 mh Brush Voicing	L19	952-016273
Diode		D19, 98-113	919-024769
IC	Rhythm Function Generator	IC23	991-024579
IC	Digital Noise Generator	IC24	991-024108
Socket	8-Pin	IC24	906-021448
Socket	24-Pin	IC23	906-018905-002
Transistor	PNP Accompaniment Keydown Detector	Q43	991-010098
Transistor	Driver, Keyer, Amp	Q44, 45, 83, 87-91	991-008393
Transistor	Instrument Preamp	Q85	991-002298
Transistor	Darlington Snare Amp	Q84	991-016727
TAB PANEL ASSEMBLY			
Guide	Slider		976-005170
Jack	Headphone		910-016688
Knob			915-024114
Potentiometer	10K Lower Flute Volume	VR6	925-021442-007
Potentiometer	100K Rhythm Volume & Sustain	VR13, 3	925-021442-006
Potentiometer	1M Rhythm Speed	VR12	925-021442-010
Pusher	Long		964-001900
Pusher	Medium		964-001901
Pusher	Short		964-001906
Resistor	WW 150 Ohm 10% 2W		924-010471-151
Spring	Contact		917-005166-001
Spring	Toggle		975-002338-001
Switch	Leslie On/Off		960-010669-001
Switch	Power On/Off		960-010669
Tab	Accordion		915-009876-296
Tab	Auto Wow		915-009876-298
Tab	Banjo		915-009876-272
Tab	Bass Full		915-009876-287
Tab	Bass Soft/Medium		915-009876-299
Tab	Boogie Woogie Bass		915-009876-340
Tab	Cello 16		915-009876-243
Tab	Chord Hold		915-009876-332
Tab	Country Western		915-009876-302
Tab	Flute 4		915-009876-246
Tab	Flute 8		915-009876-219
Tab	Flute 16		915-009876-218

PARTS LIST

Part	Description	Schematic Reference	Part Number
TAB PANEL ASSEMBLY (Continued)			
Tab	Genie Voices Normal/+ Organ		915-009876-297
Tab	Guitar		915-009876-324
Tab	Guitar Bass		915-009876-276
Tab	Guitar Strum		915-009876-331
Tab	Harmonic Flute		915-009876-309
Tab	Harmonica		915-009876-311
Tab	Harpsichord		915-009876-278
Tab	Harpsichord Arpeggio		915-009876-335
Tab	Hawaiian Guitar		915-009876-271
Tab	Latin		915-009876-269
Tab	Lower Full		915-009876-260
Tab	Lower Soft/Medium		915-009876-259
Tab	Magic Genie Chords On		915-009876-329
Tab	Mandolin		915-009876-279
Tab	March		915-009876-295
Tab	Oboe 16		915-009876-306
Tab	Pedal String Bass/Guitar Bass		915-009876-301
Tab	Pedal Sustain Off/On		915-009876-249
Tab	Piano		915-009876-282
Tab	Piano Arpeggio		915-009876-330
Tab	Piccolo		915-009876-310
Tab	Repeat/Perc/Solo		915-009876-300
Tab	Rhythm Start Normal/Auto		915-009876-293
Tab	Rock		915-009876-275
Tab	String Bass		915-009876-284
Tab	Strum Upbeat/Downbeat		915-009876-338
Tab	Swing		915-009876-281
Tab	Trombone 16		915-009876-233
Tab	Ukulele Strum		915-009876-339
Tab	Vibes		915-009876-308
Tab	Vibra Harp		915-009876-285
Tab	Vibrato Off/On		915-009876-119
Tab	Violin		915-009876-307
Tab	Waltz		915-009876-283
TONE GENERATOR & PEDAL BOARD ASSEMBLY			
Capacitor	Electrolytic 4 UF 20V		945-002333
Capacitor	Electrolytic 25 UF 25V		945-008895-008
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Polystyrene 220 PF 2.5% 63V		946-024767-006
Capacitor	Tantalum .22 UF 20% 35V		946-012624-224
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Capacitor	Tantalum 8.2 UF 20% 25V		946-021452-004
Capacitor	Tantalum 10 UF 20% 35V		946-021452-005

PARTS LIST

Part	Description	Schematic Reference	Part Number
TONE GENERATOR & PEDAL BOARD ASSEMBLY (Continued)			
Coil	Oscillator		952-018874-003
Coil	70 MH		956-018877
Diode	Keying	D3, 4, 22-30	919-024769
Diode	Glide	D1	919-024117
Diode	Low Capacity	D2	919-010873
IC	TOS	IC1	991-018813-001
IC	TOS	IC2	991-018813-002
IC	6-Stage Divider	IC3-12	991-021331-002
Potentiometer	100K 20% Vibrato Speed Adjust.	VR1	925-004349-010
Potentiometer	250K 20% Harmonica Range Adjust.	VR2	925-004349-002
Socket	14-Pin IC		906-018905
Transistor	Pedal Cancel Trigger	Q48	991-025535
Transistor	Master Oscillator	Q4	991-002232
Transistor	Vibrator Oscillator & Cancel Trigger	Q2, 47	991-008393
Transistor	Vibrato Delay Switcher	Q1	991-013544
Transistor	Darlington, Oscillator Amplifier Keyer.	Q3, 50, 51, 53	991-016727
Transistor	PNP Pedal Keyer	Q49	991-010098
UPPER KEYBOARD FLUTE GROUPS & FILTER BOARD ASSEMBLY			
Capacitor	Electrolytic 500 UF 18V	C4	945-008895-080
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 6 UF 20V		945-008895-007
Capacitor	Electrolytic 10 UF 20V		945-008895-009
Capacitor	Electrolytic 25 UF 25V	C14	945-008895-008
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Capacitor	Tantalum 1.0 UF 35V		946-021452-002
Diode		D35-37	919-024769
Network	Keying (8-Pin)		949-022778
Network	Keying (14-Pin)		949-022779
Photocell	Tremolo	P1	948-022782
Transistor	Collector Amps	Q7,9-10,11,13,14,16, 20-22, 40	991-008393
Transistor	Driver	Q17	991-018238
Transistor	FET Flute Switcher	Q8, 12, 23	991-022774
UPPER KEYSWITCH BOARD ASSEMBLY			
Actuator	Keyswitch		964-024116
Coil	70 UH	L12	956-018877
Spring	Clip		976-009364-002
Spring	Contact		917-022999
Spring	Pull Down		975-007085

PHANTOM VIEWS & PHOTOGRAPHS

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Quality Control Board 6
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Rhythm Board 13
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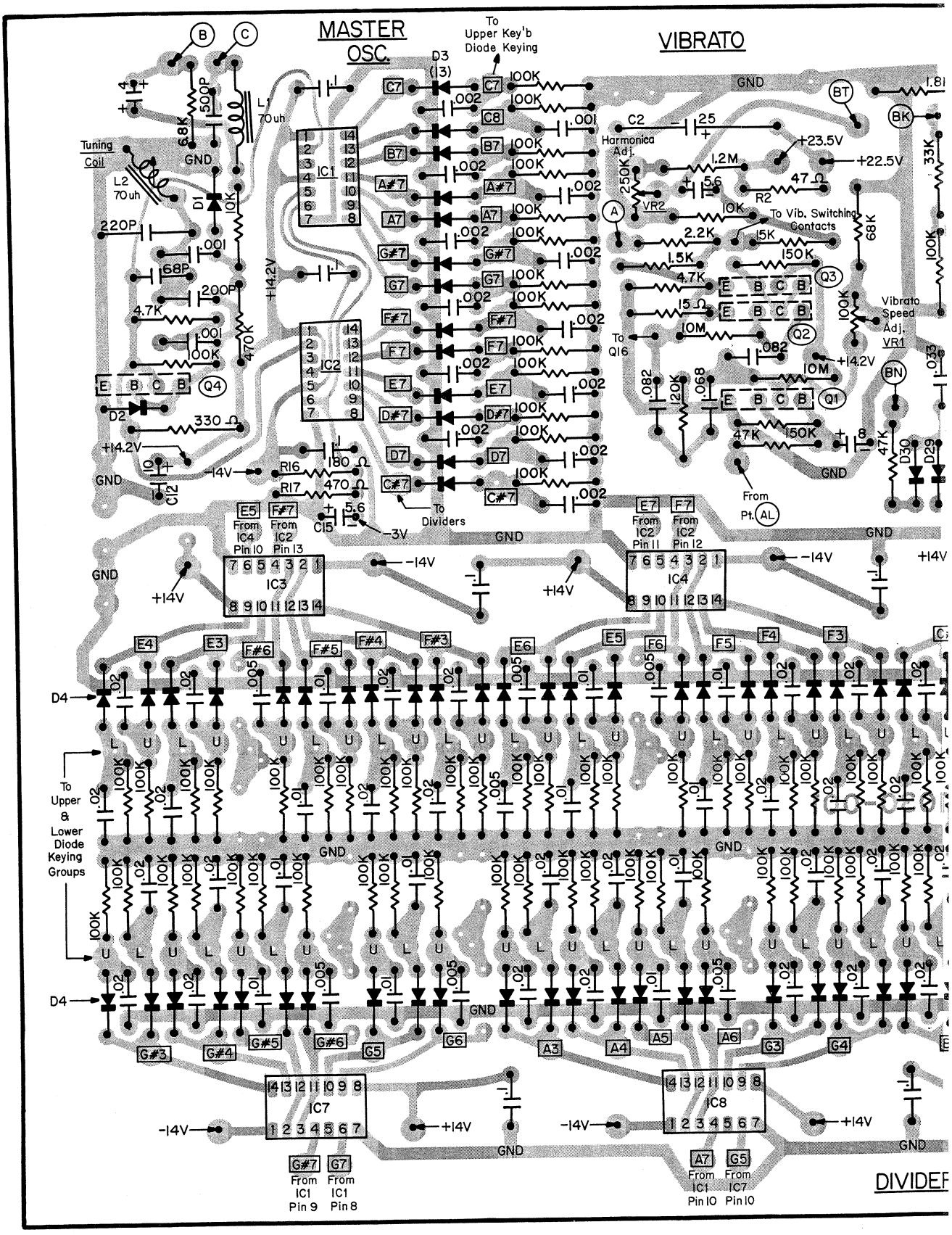
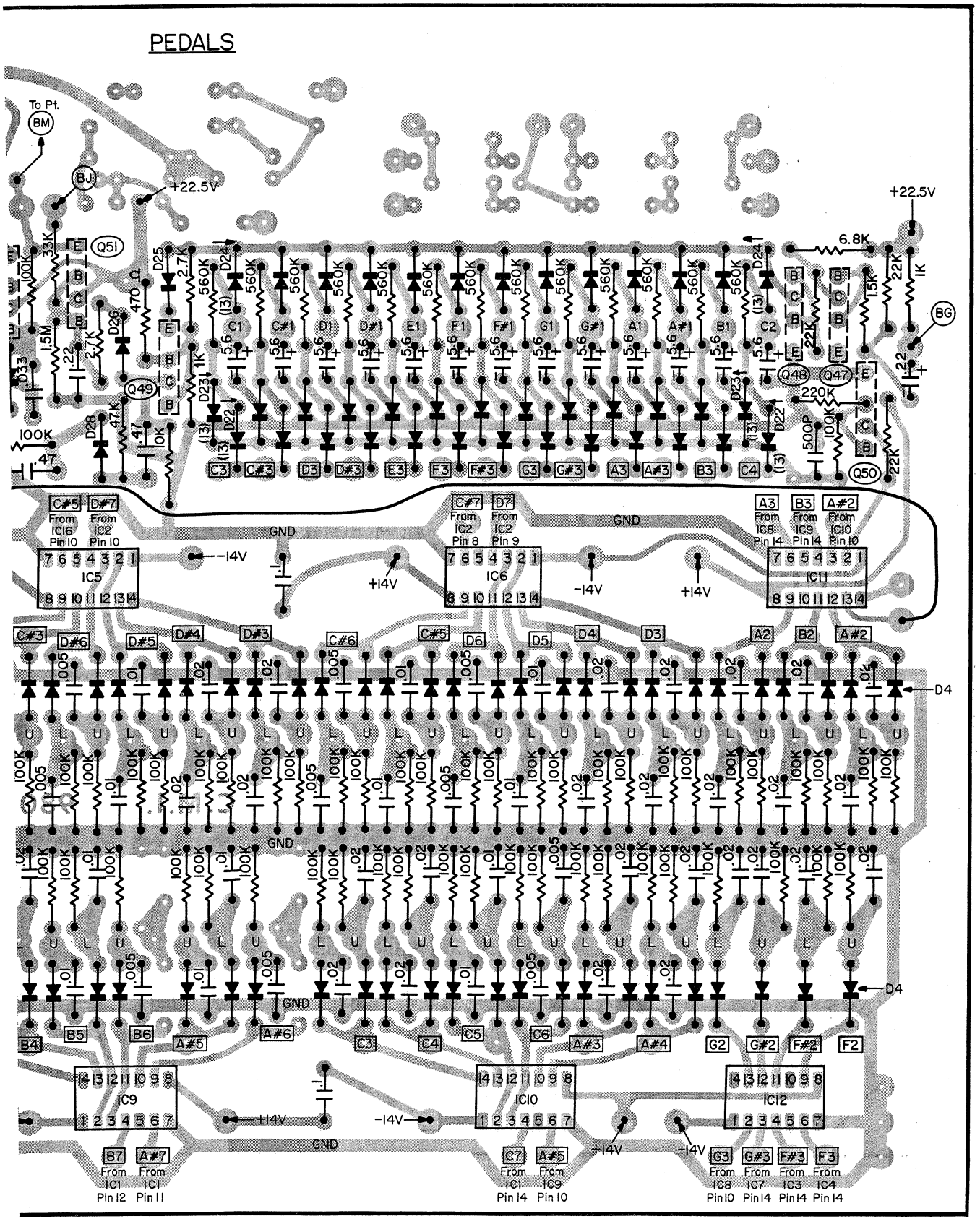
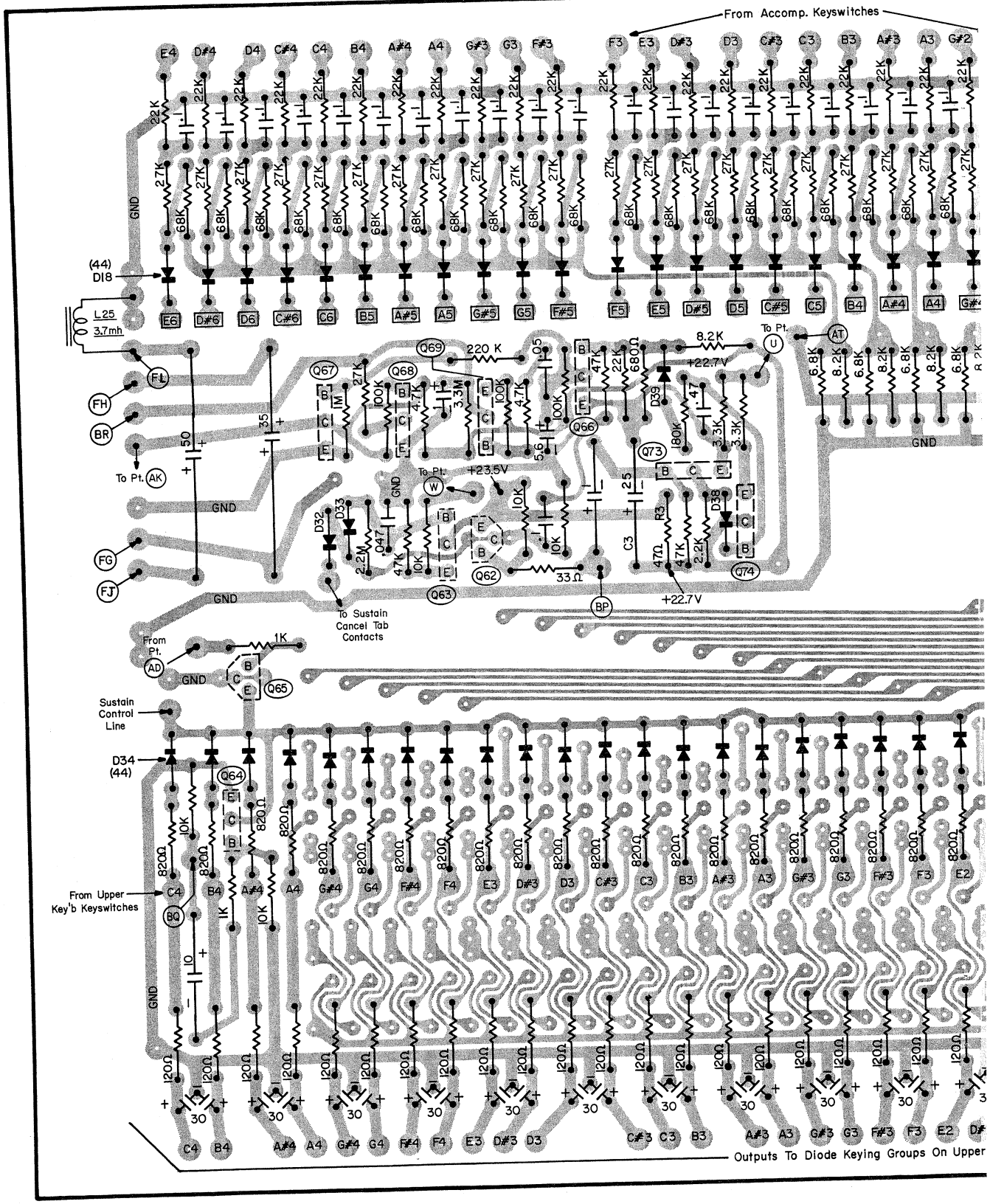
Amplifier/Power Supply/Expression Pedal (Bottom View) 16

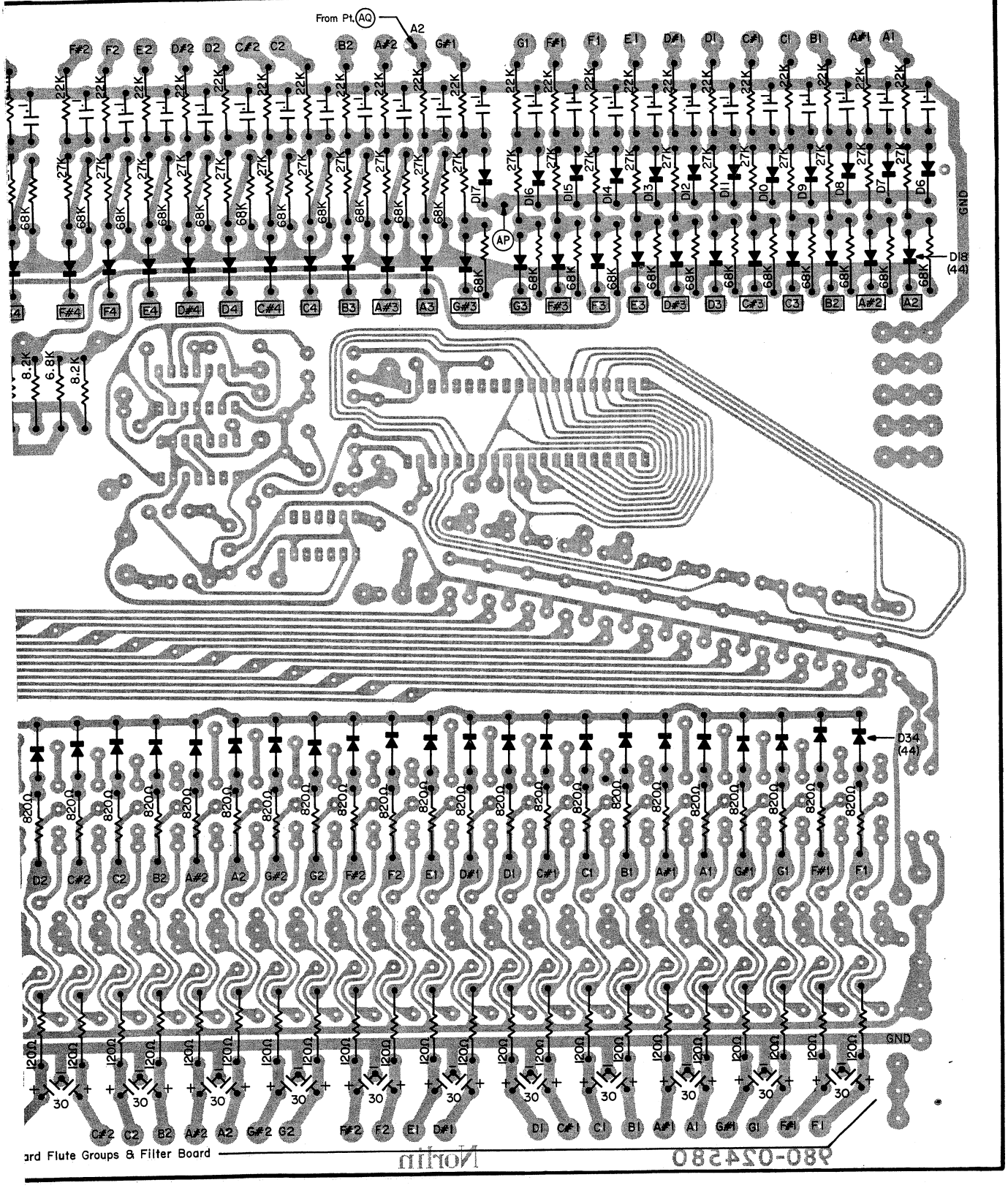

MASTER OSC.
VIBRATO
To Upper Key'b Diode Keying
Tuning Coil
L1 70uh
L2 70uh
IC1
IC2
IC3
IC4
IC7
IC8
Harmonica Adj.
VR2
Vibrato Speed Adj. VR1
To Vib. Switching Contacts
To Q16
From Pt. AL
To Dividers
To Upper & Lower Diode Keying Groups
From IC4 Pin 10
From IC2 Pin 13
From IC2 Pin 11
From IC2 Pin 12
From IC1 Pin 9
From IC1 Pin 8
From IC1 Pin 10
From IC7 Pin 10
GND
+14.2V
-14V
-3V
+23.5V
+22.5V
+14V
DIVIDER

DIVIDERS & PEDAL BOARD



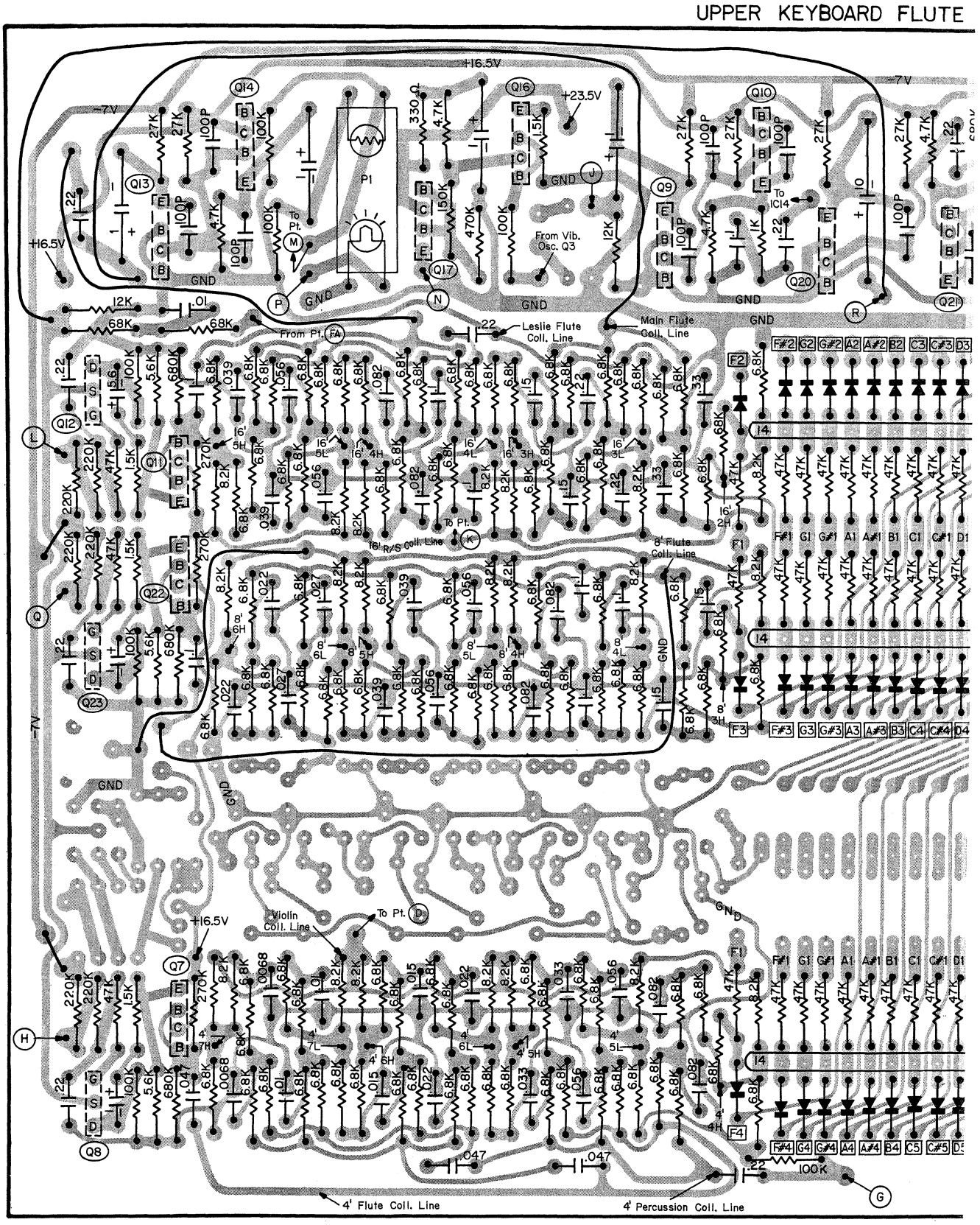

From Accomp. Keyswitches
E4 D#4 D4 C#4 C4 B4 A#4 A4 G#3 G3 F#3
F3 E3 D#3 D3 C#3 C3 B3 A#3 A3 G#2
22K
27K
68K
GND
(44) DI8
L25 3.7mh
E6 D#6 D6 C#6 C6 B5 A#5 A5 G#5 G5 F#5
F5 E5 D#5 D5 C#5 C5 B4 A#4 A4
FL
FH
BR
To Pt. AK
FG
FJ
GND
50
35
Q67
Q68
Q69
220 K
.05
Q66
47K
680Ω
8.2K
+22.7V
To Pt. AT
6.8K
8.2K
D39
.47
180K
3.3K
Q73
.25
C3
R3
D38
Q74
+22.7 V
To Pt. W
+23.5V
D32
D33
.047
2.2M
4.7K
10K
Q62
Q63
33Ω
BP
To Sustain Cancel Tab Contacts
From Pt. AD
1K
Q65
Sustain Control Line
D34 (44)
Q64
820Ω
From Upper Key'b Keyswitches
BQ
10
120Ω
30
C4 B4 A#4 A4 G#4 G4 F#4 F4 E3 D#3 D3 C#3 C3 B3 A#3 A3 G#3 G3 F#3 F3 E2
Outputs To Diode Keying Groups On Upper

LOWER KEYING BOARD

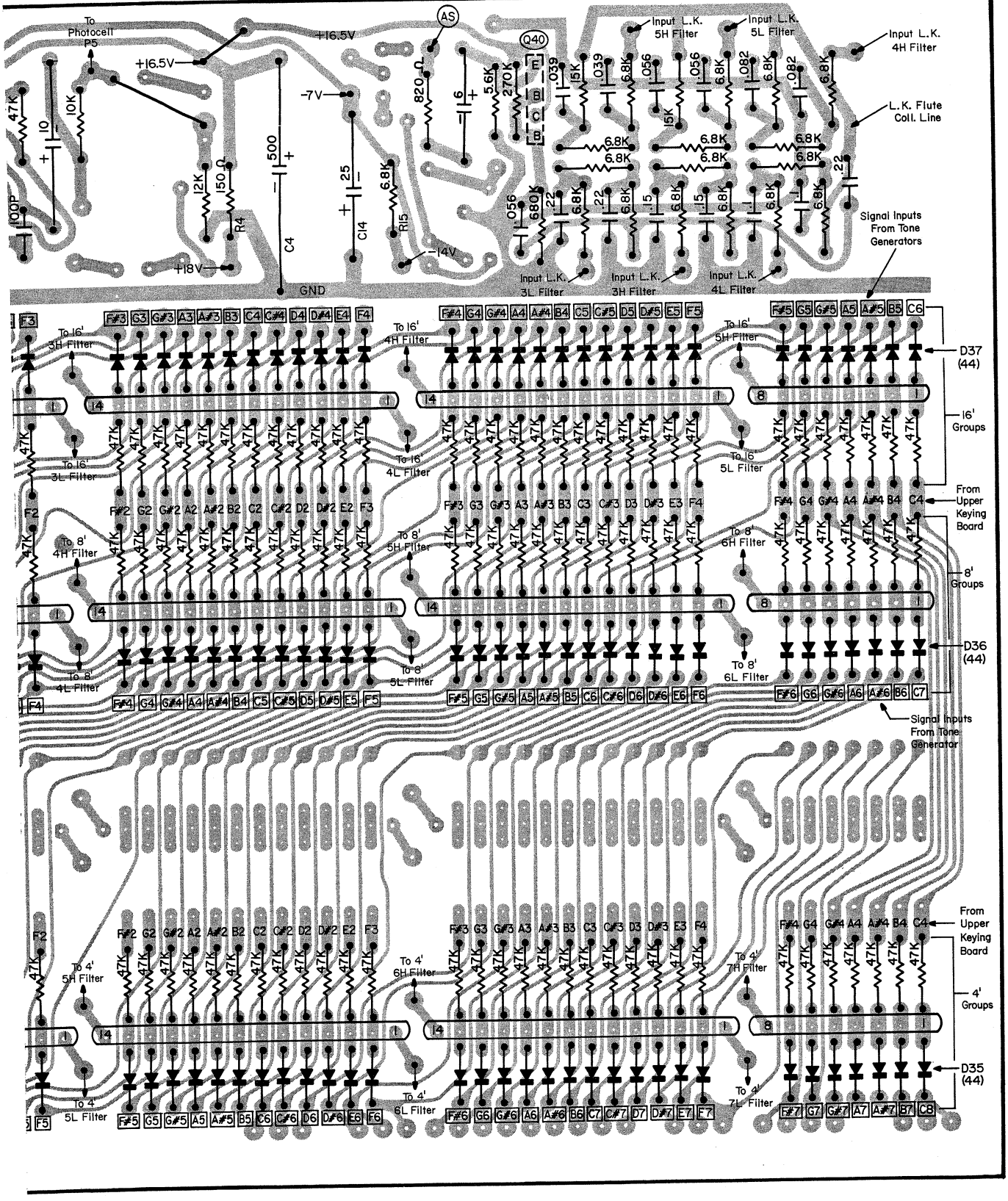

From Pt. AQ
A2
F#2 F2 E2 D#2 D2 C#2 C2 B2 A#2 G#1
G1 F#1 F1 E1 D#1 D1 C#1 C1 B1 A#1 A1
22K
27K
68K
D17
D16 D15 D14 D13 D12 D11 D10 D9 D8 D7 D6
AP
GND
D6 (44)
F#4 F4 E4 D#4 D4 C#4 C4 B3 A#3 A3 G#3
G3 F#3 F3 E3 D#3 D3 C#3 C3 B2 A#2 A2
8.2K
6.8K
8.2K
D34 (44)
820Ω
D2 C#2 C2 B2 A#2 A2 G#2 G2 F#2 F2 E1 D#1 D1 C#1 C1 B1 A#1 A1 G#1 G1 F#1 F1
120Ω
30
GND
C#2 C2 B2 A#2 A2 G#2 G2 F#2 F2 E1 D#1 D1 C#1 C1 B1 A#1 A1 G#1 G1 F#1 F1
ard Flute Groups & Filter Board
NOTIO
980-0245B0

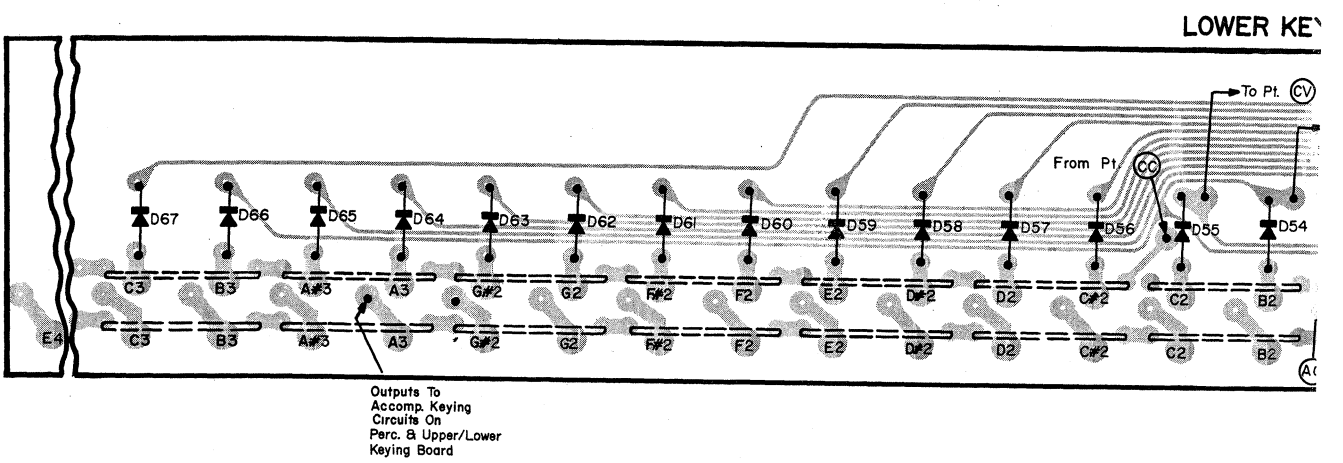
QUALITY CONTROL BD.

-8V
+17V
Q28
From Pt. K
27K
5.6
50
.015
15K
47K
120K
From Pt. DE
10K
AJ
15K
800P
18K
120Ω
Q71
GND
L13
500 mh
47K
5.6
8.2K
.01
Q72
820K
AM
AN
680Ω
.01
10
22K
6.8K
8.2K
Q37
15K
Aux. Input
27K
22K
.1
.4
3.3K
22K
1.5M
10K
GND
BV
P3
47K
GND
47K
BU
Q70
.5
680K
4.7K
270K
Q38
+17V
10K
To Photocell P5
+23.5V
.22
22K
To Pt. R
L10
10H
.5
10K
GND
GND
4.7K
10
+17V
.5
47Ω
R5
+18V
To Pt. EW
BM
Q58
47K
6.8K
-14V
R18
4.7K
-8V
Q59
10K
10K
10
1.8K
BL
EX
GND
C5
500
C16
200

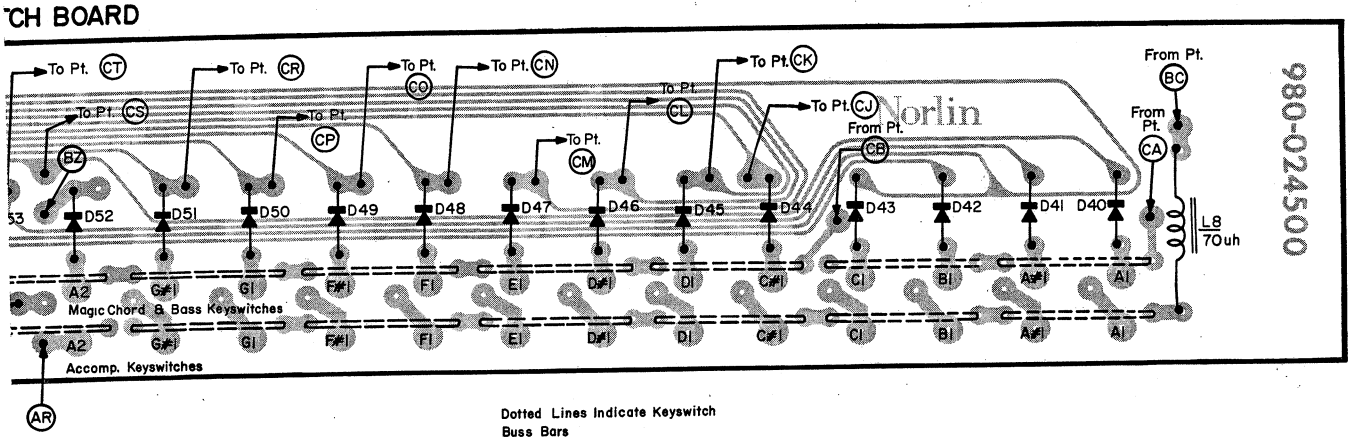

+16.5V
-7V
GND
Q13
Q14
Q16
Q17
Q9
Q10
Q20
Q21
Q12
Q11
Q22
Q23
Q8
Q7
P1
To Pt. M
From Vib. Osc. Q3
+23.5V
From Pt. FA
Leslie Flute Coll. Line
Main Flute Coll. Line
16' R/S Coll. Line
8' Flute Coll. Line
Violin Coll. Line
To Pt. D
To Pt. K
To IC14
4' Flute Coll. Line
4' Percussion Coll. Line
F#2 G2 G#2 A2 A#2 B2 C3 C#3 D3
F#1 G1 G#1 A1 A#1 B1 C1 C#1 D1
F#3 G3 G#3 A3 A#3 B3 C4 C#4 D4
F#4 G4 G#4 A4 A#4 B4 C5 C#5 D5

GROUPS & FILTER BOARD



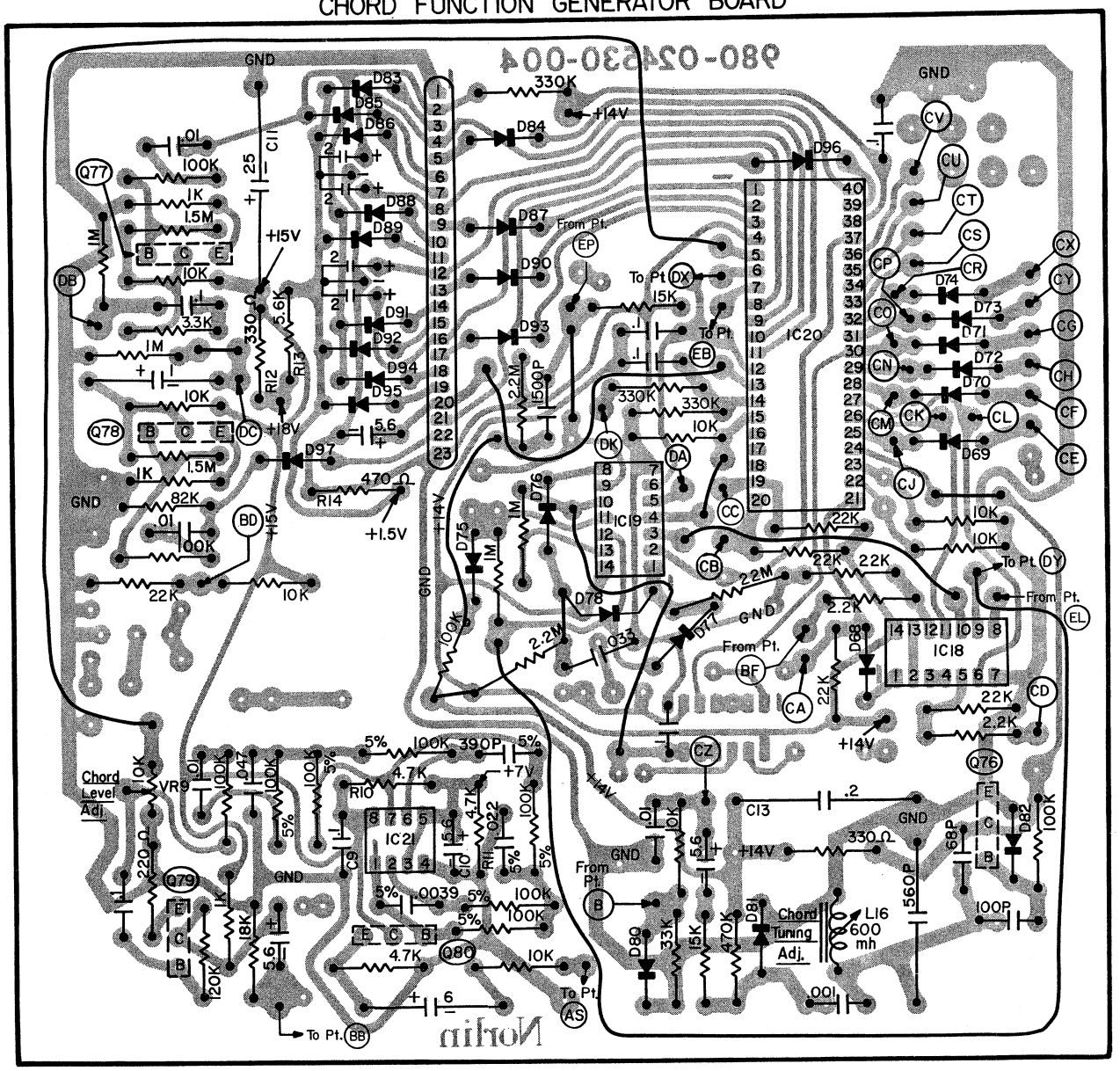

LOWER KE
To Pt. CV
From Pt. CC
D67
D66
D65
D64
D63
D62
D61
D60
D59
D58
D57
D56
D55
D54
C3
B3
A#3
A3
G#2
G2
F#2
F2
E2
D#2
D2
C#2
C2
B2
E4
Outputs To
Accomp. Keying
Circuits On
Perc. & Upper/Lower
Keying Board

'CH BOARD

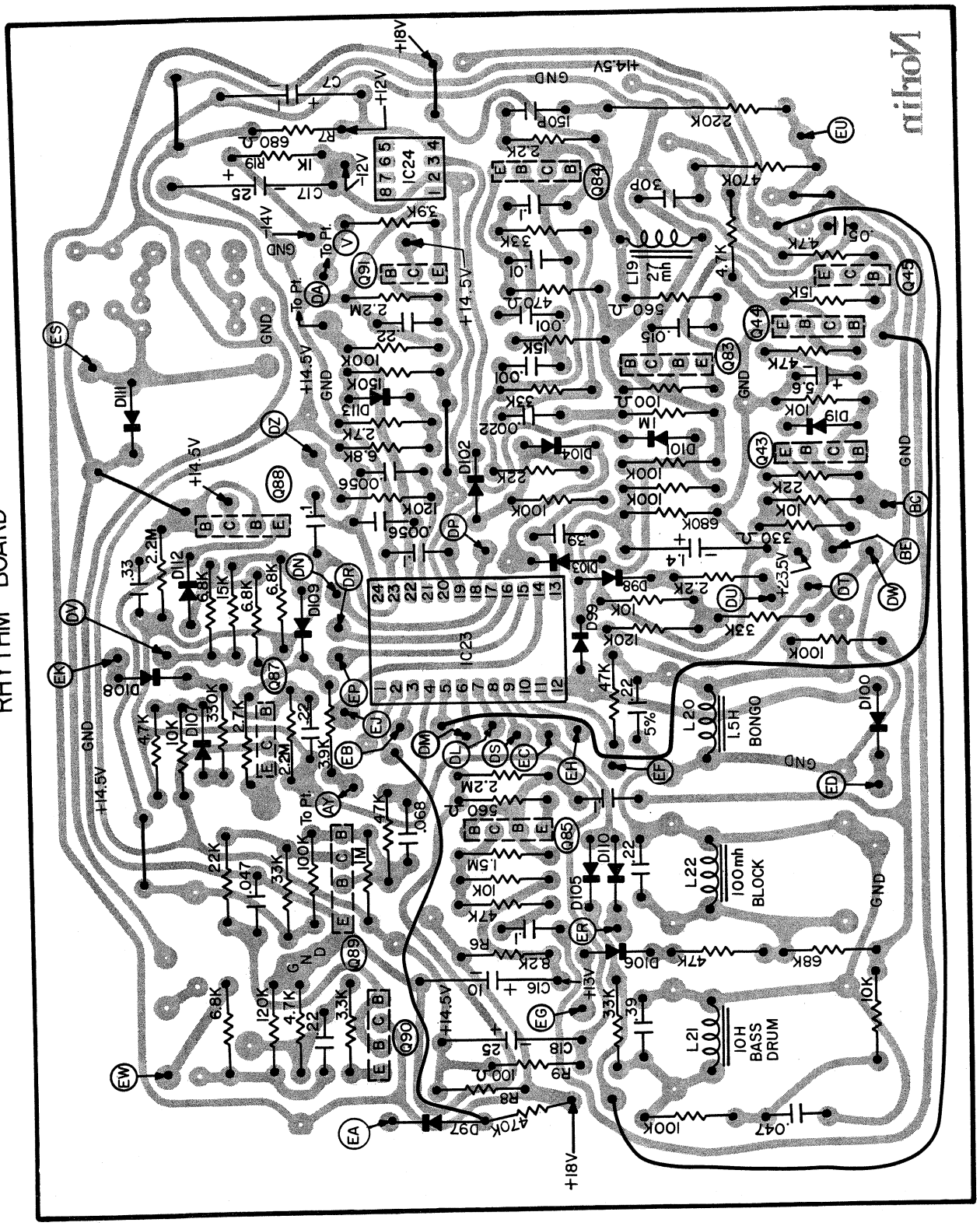


Dotted Lines Indicate Keyswitch Buss Bars

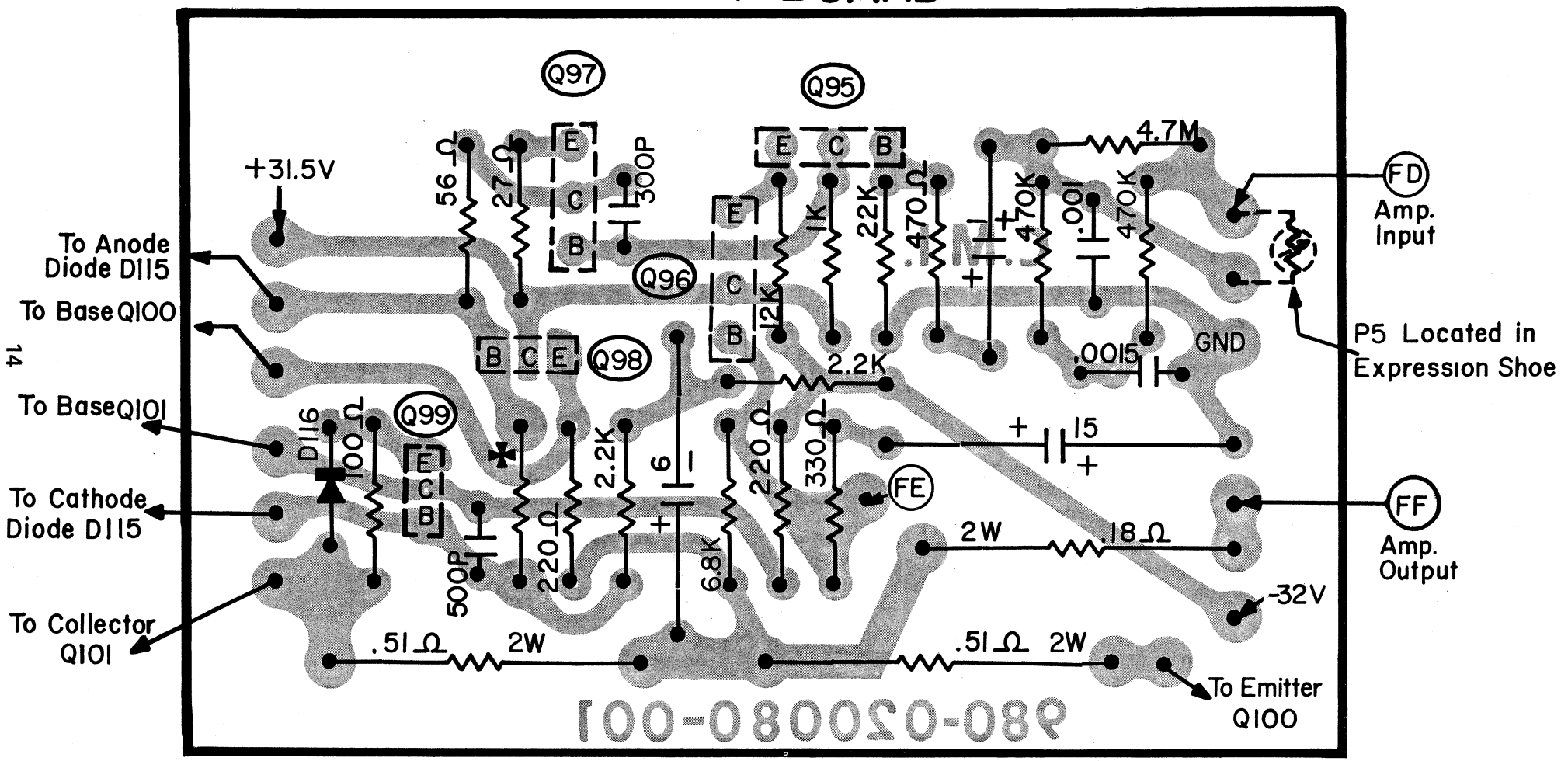
CHORD FUNCTION GENERATOR BOARD



RHYTHM BOARD



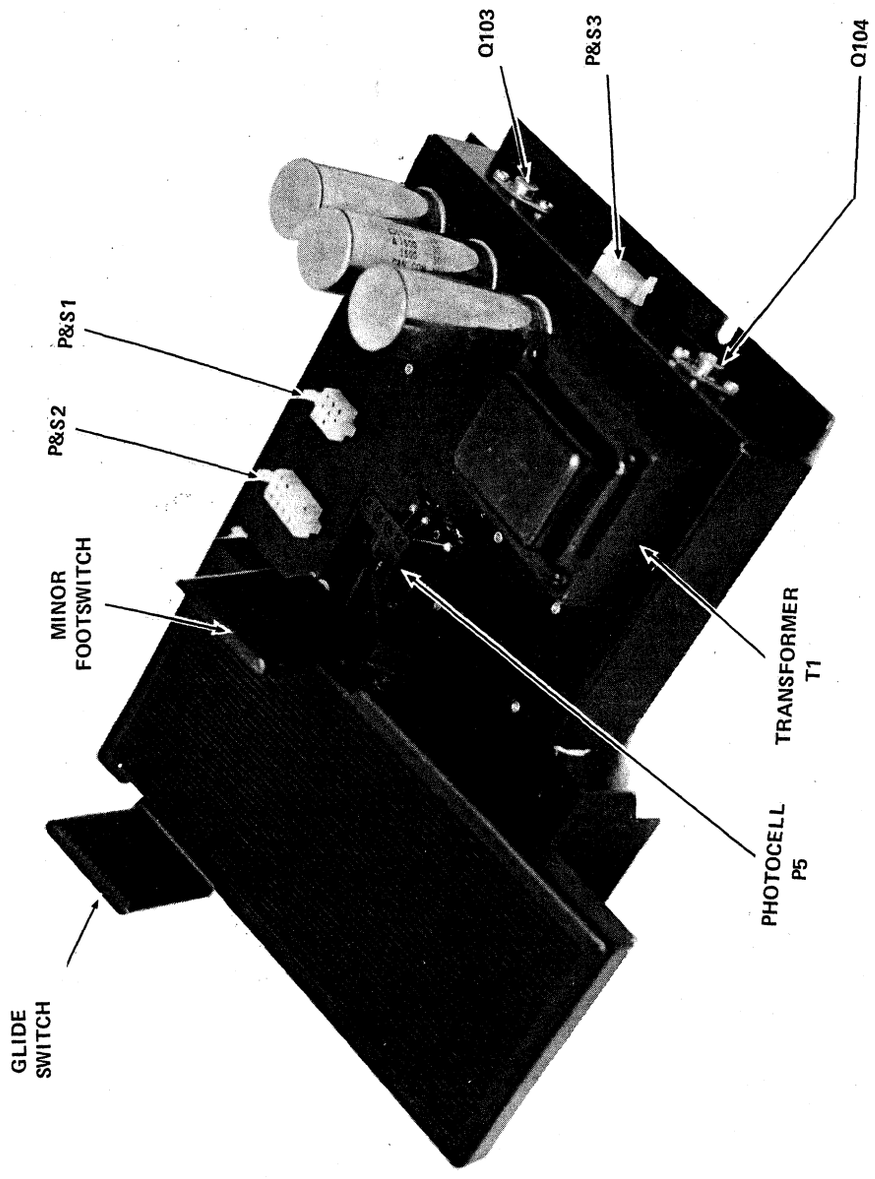
AMPLIFIER BOARD



PHOTOGRAPHS

AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY

(Top View)



PHOTOGRAPHS

AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY

(Bottom View)